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ABSTRACT

Insight into the structure of the labor market and its operations in terms of careers can be gained through analysis of occupational mobility patterns at a detailed category level. Methodology components used to extend previous methods of defining career fields as evinced in mobility patterns are: (1) mobility matrix creation: (2) mobility weighting of job characteristics data: (3) pairwise dissimilarities coefficient computations: (4) cluster analysis of dissimilarities data: and (5) cluster decomposition along principal dimensions. The standard hierarchical cluster analysis algorithm is amended to yield a variable-connectedness method. The Occupation Systems Theory is developed which provides the conceptual basis for what is seen in the occupational mobility structure. Results of an empirical analysis of 275 detailed 1970 Census occupations and 117 job characteristics variables appear to conform with the recently advanced "job family" method of occupational classification, and the various clusters underscore the importance of the techological orientation of jobs as an intervening mechanism in career formation. (Although this data is based on past Census figures, the structure of analysis could be applied to more recent figures.) (Author/NRB)

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Careers in the Labor Market:

An Empirical Assessment of the Types of Careers and Their Defining Characteristics

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INTRODUCTION

This paper extends the empirical analysis of the structure of occupational mobility as originally reported in my Ph.D. dissertation.[1] That research sought to identify clusters of detailed occupational categories that were related in terms of direct mobility interactions (mutualities) and similarities in their occupational mobility distributions (commonalities). A mobility matrix was created from data available in the 1970 Census of Population and the resulting estimates of the proportions of workers who moved among the detailed categories were used to form metrics that measured the degree of similarity in mobility distributions between all category pairs. A total of 304 detailed occupations were examined. A hierarchical cluster analysis algorithm was then applied to the matrix of similarities coefficients for the purpose of identifying the various clumpings of job categories that have relatively similar mobility distributions. Through use of this neutral methodology it was revealed that the structure of occupational mobility appears to conform well with the recently advanced "job family" method of occupational classification and that the various clusters tend to underscore the importance of technology as an intervening mechanism governing similarity associations among detailed job categories.[2]

Research of this type can be seen as an analysis of the career functioning of the job market. There are, of course, several forms of analysis of careers in the job market. This is due in part to the different perspectives of researchers from the social science disciplines of economics, psychology, and sociology. While it does provide insights on career functioning, the methodology used in my dissertation

is an incomplete form of career analysis. It assists in identification of the typology of careers, but in focusing solely on mobility interchange, it provides little evidence on the importance of various factors that give rise to the careers. We obtain an exterior view of the various career-houses from the methodology; we do not see the supporting foundations and substructures. The principal extension reported in this paper is the integration of basic job elements variables into the analysis. A host of micro-economic job elements variables--relating to skills, abilities, responsibilities, knowledge requirements, training requirements, tools and relationships to machines, job environments, physical requirements, dealings with people, earnings, sex and race composition, years of schooling, experience, industry, and information sources for performing work--will be incorporated into the analysis in order to uncover the factors that give form and meaning to the careers.

Additional research method extensions include the following. First, an implication drawn from Occupation Systems Theory (OST) is used to restrict the population in the labor force under study to individuals in the post-education population who meet a certain age test. Second, the hierarchical clustering algorithm is amended, allowing for "variable connectedness" in order to improve upon some of the inherent deficiencies of commonly utilized approaches. Third, a format for decomposition of the factors responsible for the existence of a given cluster of occupations is used in order to advance understanding of the underlying causes of cluster formation. These methodological improvements enable a much more detailed assessment of career functioning of the job market than was possible from the previous analysis framework.

Meaning of Careers

When we speak of "careers" it is not always clear what we are talking about. Often the concept is reserved, in somewhat elitist terms, for high-level jobs such as in science, engineering, medicine, and law. When we view careers in this manner, we are not saying that only people in high-level jobs have careers. Rather, we are merely reflecting our ignorance of the other types of careers that exist in the job market. We tend readily to associate "careers" with the so-called "professions" mainly because of the ease of identifying the characteristics that give form to these distinct career-types. For such jobs, the training is lengthy, specific, and distinct; the type-of-work performed is specialized and well-defined; prestige is substantial; and, compensation is well above the norm. In addition, occupational mobility tends to be very limited for such jobs. That is to say that the range of jobs to which the training and skills of these high-level jobs can be applied is very narrow. People with such training stick to their profession. It represents essentially the only avenue for reaping the rewards of their human capital investments. We see that we have a few compact, distinct, easily identifiable careers in the job market.

Yet the concept of "careers" extends substantially beyond the concept of "professions." People in a variety of occupational walks-of-life can be said to have careers. We might reasonably speak of a career in vehicle operation, one in machine-tool work, one in public relations, and so forth. Training in such careers may be acquired on a more or less informal basis. Nevertheless, specific skills and abilities are developed and employed. Furthermore, these skills and

abilities may be applicable to a larger number of identifiable jobs in the economy. That is, the career may consist of a number of job categories as opposed to the one job associated with a given professional career.

Careers can also be viewed as a sequence of hierarchically-related jobs. Young workers enter career-lines at the bottom of their respective ladders and advance as they acquire increasing skills, abilities, and responsibilities.[3] Mobility is an integral part of this view of careers, as opposed to the absence of mobility for cases of compact professional careers. This view of careers also suggests that the jobs in a given career domain will involve a central technological focus, such as the use of specialized tools, involvement with machines, or the provision of a certain type of service. The notion of families of jobs with each job family concentrated about a principal technological dimension of the production of goods and services is central to this view of careers.[4] Often the mobility associated with such career-lines will be in an upward direction. But this concept of careers is broader than sequential job change up the ladder of increasing skills, abilities, and responsibilities. Lateral and downward mobility are also possible within a career domain.

The amorphous quality of the term "careers" is probably never more evident than when one examines the variety of perspectives on careers that exist among the social science disciplines. For psychologists, discussions about careers are explicitly discussions centered on the personalities, attitudes, aptitudes, interests and perceptions of the people involved. Early work in psychology was directed toward occupational or vocational choice theories with emphasis on choice of

occupation as a relatively distinct event in life.[5] Although the theory of occupational choice appears in various guises (trait psychology, individual differences, differential psychology, actuarial or factorial approach), the basic tenet of this approach is that individuals are endowed with differing patterns of aptitudes and, as a consequence, the potential for success of an individual in a given job depends on the "fit" of the individual's traits with the requirements of the job. A modern day example of vocational choice theory is found in the writings of Holland (1973) and others.[6] Here more emphasis is placed on the personality type of the individual and the match of personality type and environmental types. The labor mobility implications of a lack of consistency and congruence of personality and environmental type are obvious.

Vocational development theory (VDT) in its placement of emphasis on the "life stages" through which individuals pass offers an alternative psychological perspective on careers. VDT is summarized succinctly by Zaccaria:

> Basically, the individual does not choose an occupation, but rather makes a series of occupational or occupationally-related choices at different life stages which, when taken cumulatively, result in vocational development rather than occupational choice, per se.[7]

There are several historical antecedents to modern theories of vocational development as a lifelong process of decisionmaking. Buehler (1951) identified several psychological life stages through which individuals pass, each stage with approximate age ranges: (1) Growth Stage (birth to 14 years); (2) Exploratory Stage (15 to 25 years); (3) Establishment Stage (26 to 45 years); (4) Maintenance Stage

(46 to 65 years); and, (5) Decline Stage (66 years to death). Miller and Form (1951), expanding on previous work of Davidson and Anderson (1937), developed a classification of life stages which is work oriented. The major stages of this classification are: (1) Preparatory Work Period: (2) Initial Work Period; (3) Trial Work Period; (4) Stable Work Period; and, finally, (5) the Retirement Period. In Ginzberg et al. (1951), we see a first attempt at a longitudinal theory with vocational development overtones. There are four major components to the Ginzberg approach. First, the long-term nature of the process of occupational choice is recognized. Second, with the advancement of time, the process is recognized to become increasingly irreversible. Third, the final position of settlement of the individual in an occupation type is viewed as a compromise between desired goals and realistic labor market alternatives. Fourth, the process is viewed as occurring in a series of relatively distinct stages. These stages are identified as the (1) Fantasy Period of Childhood, (2) Tentative Period of Early Adolescence, and (3) Realistic Stage of Middle and Late Adolescence. In the tentative period, the individual begins to bring his assessment of his capabilities and interests in conformance with potential alternatives in the job market. The realistic stage is a period in which the individual actually explores alternatives and narrows his range of choice. In the writings of Donald E. Super (1957, 1977), aspects of which are discussed below in the section on Occupational Systems Theory, we have the modern and most widely accepted exposition of VDT.

The interests of sociologists in careers are often intertwined with their interests in the process of social stratification.[8] Two

viewpoints dominate theories of social stratification. The functionalist theoretical viewpoint sees social status as a reflection of individual contributions to society's needs. In conflict theory, the rewards distribution of income and prestige is envisioned to be a reflection of the distribution of power.[9] In this view, "social inequality arises from domination of one group by another."[10] The role of social forces encompasses more than just barriers to mobility among different occupational groups. It even permeates the internal labor market allocations of workers within the firm.[11]

The divisions among sociologists on social stratification questions are parallel to the divisions among economists on questions of general functionings of the job market. Divisions among economists concerning careers have their roots in varying perspectives on the role of human capital in career attainment and as an intervening factor in career advancement. The main schools of thought divide into the neo-classical framework and segmented labor market (SLM) theories.[12] Neoclassical economists place considerable emphasis on education, training and other supply-side variables as determinants of the individual's economic status. Formal education is seen as increasing the individual's "trainability." Screening and credentialsm effects, emphasized by the SLM theorists, are downplayed. Through on-the-job training we have the more direct contributions of investments to marginal productivity. Job mobility plays an important role in the capital acquisition process at the firm level. In fact, job mobility is seen as signalling the junctures of the process. A hierarchical structuring of jobs in the firm is envisioned with different levels representing varying skill content. Jobs at each step build onto the

skill-base of the individual worker and thereby enhance the probability of moving to the next step. Movement from one job to the next, then, can be taken as merely evidence of the functioning of the life-cycle investment process, the crossing of skill thresholds.

The basic contentions of SLM theorists are that the job market is divided into "good" jobs and "bad" jobs; that blacks, other minorities, and females are relatively confined to the "bad" jobs of the secondary sector; that mobility is limited in the secondary sector to movement between jobs in that sector; that the characteristics of jobs perpetuate poor work habits, lack of training and other forms of human capital investment, low capital/labor ratios, and job instability. Institutionalized discrimination is very much a part of the underlying foundations of the SLM approach. Taken together, it is easy to see how these traits and mobility limitations would lead to a conclusion that the continuation of poverty is, in part, a consequence of labor market operations. The system, according to SLM theorists, has its own built-in feedback mechanisms that reinforce the existence of a class of secondary jobs. Technology is not given in their system; it is endogenous. The existence of a low-skilled supply source of labor calls for the use of less-technically-advanced machinery and equipment; little or no training is required for such jobs; and, an important avenue to job-ladders of increasing skills, abilities, responsibilities, and pay is blocked.

The historical antecedents of the debate between segmented market theorists and the neoclassical school dates back to works by Mill (1848) and Cairnes (1874) on the concept of noncompeting groups in the labor market and more recent contributions by the neoinstitutionalists

in the 1950's and the 1960's.[13] It is important to note that much of the empirical literature on questions of segmentation have used labor mobility, generally occupational mobility, and corresponding change in economic status to test for the importance of human capital variables as well as the general "openness" of the job market to both blacks and whites.[14] It is also important to note that the research by economists on questions of segmentation has been undertaken without addressing, much less controlling for, the natural partitions of the job market that result from the divergent technological orientations of type-of-work performed. There are important policy implications behind whether individuals advance their economic status by moving within career domains or between career domains. This is an issue that has yet to be addressed for reasons, I believe, of general lack of knowledge of the career functionings of the job market.

The meanings of careers are many and varied depending on the perspective of the discipline and its attendant research questions. To the psychologist a career is an embodiment of personality aspects of the individual and the fulfillment of a vocational development process. To the sociologist, the variety of careers that exist in the job market is a reflection of the social stratification process. To the economist, a career may be a sequence of related jobs that have similarly based educational and training requirements, that are related through promotion, transferability, and substitutability, and that involve a principal technological focus or orientation. There can be no single definition of careers anymore than there can be a single theory of careers. This is not to suggest that attempts at an inter-disciplinary approach are hopeless. We see parallels among the various

lines of inquiry that spur us on to make our various approaches more comprehensive. We should be cautious, however, not to raise our expectations too high. While the theory of careers is not practical because of the variety of perspectives on careers, a theory of careers that is more comprehensive in terms of the ranges of viewpoints it encompasses is a distinct possibility.

Role of Labor Mobility

The need for information on the career functionings of the labor market is immense. Whatever the nature of careers is in terms of the breadth of job titles encompassed in each career, our lack of knowledge of their form and characteristics places sharp limits on our ability to formulate sound public policies toward the labor market. For example, a presumed important aspect of educational policy is to prepare individuals for the world-of-work. Yet it is precisely the finer details of the operation of the world-of-work in terms of careers where our knowledge is demonstrably lacking. This problem is acute in the delivery of career and vocational guidance information. Examination of the Dictionary of Occupational Titles and the Occupational Outlook Handbook, two important tools of the guidance information system, readily reveals how our lack of knowledge on career functioning of the job market hinders the effectiveness of guidance counseling. The old saw "can't see the forest for the trees" comes to mind when reviewing these documents. We also need information on career functioning in order to form better theoretical and empirical bases for our assessments of the research questions of various disciplines.

Occupational mobility is seen as an important indicator of the types of careers that exist in the labor market and, thus, as an

elemental focus of analysis to the economist, psychologist, and sociologist alike. A basic tenet for examination of the career functioning of the job market is that when occupational mobility is analyzed at a sufficiently detailed level (large number of categories), there is career information in the patterns of occupational mobility. This does not mean that all mobility will be confined to systematically-related jobs. Some movement may even be essentially random. Other moves may be totally unrelated, for example, when a college student completes course work, quits a part-time job as a food service worker, and takes an electrical engineering position. Others may be possible only after considerable reinvestment in education and training. Yet there are still substantial reasons to suspect greater mobility interchange among similar jobs, particularly for the experienced, post-formal educational training, worker.

Plan of the Paper

The theoretical basis for the expectation of structure and the form and character of structure in occupational mobility distributions will be discussed under the heading of Occupation Systems Theory. OST is a synthesis of vocational development theory and labor market structure theories which are in turn integrated with the job cluster concept. The latter assesses microeconomic aspects of similarities among job categories. Several implications of OST are drawn which serve as guidelines for the methodological approach and form the basis for what we expect to see in our cluster representations. Next, the methodological approach will be discussed. This section will include a review of the need for integration of job elements data (characteristic descriptions of jobs including skills, abilities, responsibilities, tools and equipment and

job environmental factors) with mobility distributions along with the method for the integration. Modifications of the cluster analysis algorithm will be presented as well as the method for decomposition of the cluster analysis results. Following methodology, a review of data requirements and data sources is given. Empirical results are presented next, and the final section assesses results in relation to the theory, implications, and possible avenues for further research.

OCCUPATION SYSTEMS THEORY

The principal hypothesis of this investigation is that the job market is partitioned into subsets of occupations such that occupations within each subset have relatively similar mobility patterns. We will call this hypothesis the "job family" hypothesis. The various job families then provide evidence of the career functionings of the labor market. Occupation Systems Theory provides the theoretical underpinnings for the expectation of the form and character of the occupational mobility structure. OST is a synthesis of various theoretical aspects of economics, psychology, and sociology. The major elements of this synthesis are "vocational development" theory, "labor market structure" theory, and "job cluster" concept. Vocational development theory will form the conceptual basis for the fundamental process of labor market adaptation which affects all individuals. This process is defined and constrained to a considerable extent by various facets of labor market structure. The job cluster concept, which emphasizes the effect of technology on labor market operation, is useful in guiding the analysis along the microdimensions of the type of work performed.

Vocational Development Theory (VDT)

Super's (1957) general theory of vocational development provides the building blocks of the "supply-side" of individual behavior in the job market. The self-concept notion, the individual's continual assessment of his interests and abilities, is Super's primary innovation that ties together the VDT contributions of other writers. The development of an individual's self-concept is, of course, a dynamic process beginning in early life. Through the institutions of the home,

community, schools and contact with the world of work, youths are constantly exploring and searching for their place in life. As the individual's self-concept becomes increasingly tied to reality, vocational thinking transcends the world of fantasy. It becomes intertwined with the individual's likes and dislikes as well as perceived capabilities. According to Super, adolescence is a period of emergence of a self-concept. Youths explore alternatives and modify their self-concept based on these experiences. Initial contacts with the world of work, outside the home and school, are likely to be through part-time or vacation employment. Part-time employment also affords the opportunity for youths to test their self-concepts in real-life situations. The exploration stage of vocational development continues long after the individual's initial employment experience. The process of reality testing of the self-concept is, in general, manifest through a number of employment experiences for those increasingly committed to the labor force. There is a tendency for occupational inheritance through the informal procedure of seeking labor market information from friends, family, and neighbors.

These initial years of labor market experience have been characterized as "floundering."[15] Individuals pass through a successive series of job types, each of which has little logical relation to the last. But, as the young worker gains more information and knowledge, which enables a centering of self-concept, he becomes increasingly committed to his vocation. Increased orderliness of labor market behavior is indicative of the establishment stage. The search process continues; nevertheless, such job changes are increasingly related in that current job status is a function of previous job held.

In this trial substage, the individual is attempting to implement his self-concept. The stabilization substage of the establishment stage is characterized by goal-directed behavior. The individual has settled on a particular occupational field and thoughts turn to career advancement within that occupational field. At any occupational level, from the semi-skilled to the professional, there are likely to be changes that involve shifting from doing the work, to supervising it, to planning it.[16]

With increased stabilization of the worker in a particular vocational field, the maintenance stage is ushered in. The worker is firmly established in a career, although that career may be less than dignified. "The horizontally mobile semi-skilled worker has a 'place in the world,' even though it is a shifting place. Shifting at the semi-skilled level is its essential character."[17] In the maintenance stage, there are few attempts to seek alternative employment opportunities. The concept of maintenance does not imply satisfaction with one's place in the world of work, merely acceptance.

With the advancement of age, the individual's self-concept must, in many instances, change dramatically. The individual must accept "himself-as-he-is-becoming" instead of trying vainly to keep "himself-as-he-was."[18] Physical and mental capacities diminish. The worker may seek or be transferred to a less demanding type of work. If the older worker loses his job, he finds it difficult to obtain work in his former employment type. In such instances, he may seek work in service related jobs such as janitorial work and watchman. Shifting to self-employment in a small business enterprise is also an alternative. Finally, the process of vocational development ends in retirement.

Career patterns reflect the operation of the vocational development process. Super summarizes Miller and Form's six-fold classification for males into the following four general types: (1) Stable; (2) Conventional; (3) Unstable; and, (4) Multiple Trial.[19] Individuals with professional career goals generally possess stable career patterns. The transition is, usually, directly from formal educational training to career occupation. The conventional career pattern is characteristic of a large majority of males. Examples include managerial vocations and the skilled trades. The unstable career pattern is characterized by a sequence of trial-stable-trial vocations in which the worker fails to develop a lifetime occupation. Workers in semi-skilled job types are likely to have such patterns. The multiple-trial career pattern is characterized by frequent changes of employment between a variety of occupation types. In general, such patterns are typical of low-skilled workers. Such workers would tend to be found in the numerous classifications of low-skilled occupations in the service and laborer job types. The type of career pattern is seen to be related to the particular domain of the occupational spectrum where the individual is employed.

In recognition of differences in life patterns and social roles between men and women, particularly with respect to homemaking requirements, Super identifies seven types of female career patterns. They are as follows: (1) Stable Homemaking; (2) Conventional; (3) Stable Working; (4) Double-track; (5) Interrupted; (6) Unstable; and, (7) Multiple Trial.[20] Women who marry while in school or shortly afterwards and do not return to the work force characterize the first category. In the conventional career pattern, school is followed by

relatively brief work experience in occupations such as clerical, teaching, and nursing, before marriage. The stable working career pattern is consistent with the stable career pattern of men in that the career becomes the woman's life work. In the double-track career pattern, the woman leads a dual work life of job and homemaking. The interrupted career pattern is typified by a sequence of working, homemaking, and returning to the labor force, particularly when the children reach school age. In the unstable career pattern, the woman alternates homemaking and labor force participation in relatively frequent sequences of varying duration. The multiple-trial career pattern for women as for men involves frequent changes in employment between relatively unrelated and low-skilled jobs. The career patterns of females, we see, are typically more complex than those of males because of responsibilities of homemaking.

In his specification of a general theory of vocational development, Super has emphasized the dynamic and continuous aspects of the process. Vocational development is seen by Super as a process in conjunction with the general development of an individual's self-concept. From the fantasy periods of childhood, the individual's self-concept is ever increasingly tied to reality as the individual proceeds through formal education, initial job experience, and the trial work period before finally stabilizing in a vocation. As the individual attempts to implement his self-concept, floundering or frequent movement between unrelated job types is likely to occur. The increasing relationship between self-concept and reality, with passage of time, is concomitant with increased orderliness of labor market behavior and stabilization on a vocational level. Unfolding of the vocational development process

is through career patterns. Although some individuals possess very stable career patterns, for most, the process of adaptation to a satisfying line of work may take a number of years. Such searching activities enable the individual to focus his self-concept more sharply. Super's theory has a direct labor supply orientation. Aspects of labor demand in relation to labor market structure are treated next.

Labor Market Structure Theory

There are several structural aspects to the labor market which are inconsistent with the general assumptions of competitive economic theory. All workers are not in open competition with each other for a given stock of job vacancies which may exist at any time. Essentially the labor market is compartmentalized by education, training and knowledge requirements, by specialization and division of labor, by institutional rules that limit mobility, and by physical distance, among other items. Kerr outlines two broad types of labor markets: (1) the structureless and (2) the structured. In the first, there is limited attachment between the worker and his employer. All applicants are given an equal consideration for all vacancies. An example is the day-labor market in metropolitan communities such as Chicago. According to Kerr, "structure enters the market when different treatment is accorded to the 'ins' and to the 'outs.'"[21]

The structured labor market has two major components: the internal market and the external market. The manufacturing plant and the craft group are examples of internal markets. Dunlop has expanded on the definition of the internal labor market as "the complex of rules which determines the movement of workers among job classifications

within administrative units such as enterprises, companies, or hiring halls. These movements may be transfers, promotions, demotions, or layoffs to the exterior labor market.[22] A "web of institutional rules" governs the process of internalization of an individual worker. Initially, the worker finds himself a member of a vast, relatively undifferentiated labor pool in the external labor market. Through port-of-entry jobs, the worker is gradually initiated into the internal market. In general, the number of port-of-entry jobs into the internal labor market is inversely related to the degree of structure. Thus craft vocations might be expected to have relatively few port-of-entry jobs while semi-skilled industrial-type jobs would be expected to have several ports of entry.

Institutional rules may uniformly add to the degree of structure in labor markets, as Kerr believes. Yet there are sound economic reasons for the growth in use of job-ladders. Melvin Reder (1955) presents a model in which hiring standards vary inversely with the level of business activity. In expansionary phases of the business cycle, firms lower hiring standards and promote workers up the job-ladder. The endpoints of the job-ladder may differ substantially in terms of requirements, but between steps on the ladder these differentials may be small. In consequence, the job-ladders are viewed as part of a process whereby the firm minimizes its training costs and insures itself of a reserve of human resources in case of a surge in demand. In a recession, downgrading along the ladder minimizes employee unrest and resentment and affords a means of circumventing contractually agreed upon wage scales. Oi (1962) detects elements of quasi-fixity in labor when hiring and training costs are added to the

competitive model. The number of time periods for which the firm expects to retain an individual worker is a factor in the level of human capital investment that the firm will undertake. Firms are reluctant to lay-off workers in whom they have an investment. As a result, there is ever more reason to construct job-ladders for purposes of making some use out of otherwise redundant labor during recessions. Thus there are rational economic reasons for structured mobility relations among jobs with respect to hiring and training costs and the internal labor market's labor reserves. Of course, the functioning of internal markets, whatever its merits for least-cost production and equity within the firm, offers additional obstacles for those who are outside the walls.

The Job Cluster Concept

Labor market structure theory helps us understand how the labor market is divided into submarkets on the demand-side. The job cluster concept provides us with the particulars of that structure. A given establishment has not just one area of production, but several. The firm becomes "departmentalized" into separate areas of production as the market widens. Furthermore, through "division of labor," production in any given department is divided into a number of relatively distinct tasks, rather than a single process, which combine to form the department's production function. Through specialization and division of labor, a variety of job options arise within a given productive process. These related types of work are intertwined by the common production function. The notion of "commonalities in production" is central to the "job cluster" concept.

Although there is no single criterion for demarcation of job clusters, emphasis has been placed on the notion of "common production function" by Livernash.[23]

> Geographic location within a plant, organizational pattern and common supervision, related and common job skills, common hiring jobs and transfer and promotion sequences, as well as a common production function, tie jobs together. The notion of a common production function deserves some emphasis, however. Departments frequently signify separate job groupings as they relate to different phases of production, thus constituting a functional group of related jobs.

In his underlining of the importance of "commonalities in production" as the predominant factor in the determination of job clusters, Livernash is vaunting the role of technology.

Scoville identifies five major categories of job options which arise from the technology of production. His first category is the "tools" class: "small, individually operated pieces of equipment which usually involve the attention of one worker."[24] The second broad form of technology is the "machines" class. There are singular and multiple stages of job options which characterize the machines class. In singular types of man/machine operation, as exemplified by the occupation of "drill press operator," the job is narrowly defined. Multiple stage job options, however, arise from continuous production processes, such as a rolling-mill operation, which at various stages require worker attention. Spatial dispersion between raw material sources, manufacturing sites, product markets and even within firms gives rise to a third set of job options related to transport. A fourth classification is distinguished by lack of "formal and technological intervention between labor input and resulting output.[25]

Service work, with its labor-intensive flavor, is indicative of this form of technology. The final class of job options arises from the technology of human knowledge: "Knowledge broadly defined is an intermediary factor of production between input and output much like a piece of physical equipment.[26]

These central forms of technology are the springboard for formation of job clusters about a specific aspect of production or "situs," a concept first employed by Hatt.[27] Eight situs types are identified by Hatt: (1) political; (2) professional; (3) business; (4) recreation and aesthetics; (5) agriculture; (6) manual work; (7) military; and, (8) service. Each situs has specific subdivisions. For example, the manual work situs is divided by Hatt into five categories: (A) skilled mechanics; (B) construction trades; (C) outdoor work; (D) factory work; and, (E) unskilled labor. A number of detailed categories comprise each of these situs subdivisions. Scoville offers a reclassification of Census detailed occupational categories by job families employing criteria of promotion, transferability and substitutability and other technological considerations in demarcating boundaries.[28] As will be seen, Scoville's classification scheme makes use of the situs concept.

The common production function, central technology types, and situs aspects of the job cluster concept form the general outlines of the micro dimensions of jobs. At the very root of the concept are the specific job characteristics, the elemental factors that describe the divergent types of work performed. Ernest J. McCormick, an industrial psychologist, and his colleagues have developed a job analysis system to measure job characteristics.[29] There are essentially two types of

job analysis information. Job-oriented information describes work in terms of specific, rather production-oriented activities such as sweeping, forging metal, electrical parts assembly, and data entry. Task inventories are an example of job-oriented information that generally apply only narrowly to specific occupations. Worker-oriented information has more general applications in that these types of variables reflect human behaviors used in a variety of contexts such as problem solving ability, visual differentiation, manual dexterity, color perception, and physical handling. The Position Analysis Questionnaire, developed by McCormick, Mecham, and Jeanneret, concentrates on worker-oriented variables and recognizes that there are other important elemental differences among jobs: tools, machines, equipment and job-related devices; knowledge, education, and training requirements; job environmental factors; and, interpersonal relations among other items. A comprehensive job analysis instrument must take these differences in job elements into account. Through job analysis variables we have the micro dimensions of jobs that form the underlying bases of the job cluster concept.

OST Synthesis

Occupation Systems Theory, a term originally attributed to Smith (1966), is an integration of vocational development theory, labor market structure theory and the job cluster concept. The purpose of OST is not to provide a general theory of careers. The goals are much less ambitious. The principal objective of OST is to provide a foreshadowing of what we expect to see in the structure of occupational mobility when mobility patterns are examined on a detailed category basis. Secondarily, OST, like any body of theory, should provide a set

of implications to guide testing the research question at hand. Each of the three major bodies of theory interactively contributes to OST. Vocational development theory was previously acknowledged as supply related; labor market structure theory, primarily demand related. The job cluster concept emphasized the technological aspects of production: The variety of job types which develop from technology which are interrelated through commonalities in production. Vocational development theory and labor market structure theory combine to define the general functioning of the labor market; the job cluster concept, which contains elements of both of the aforementioned theories, defines the specifics of that operation.

The process of vocational development and the structure of the labor market are important factors in the general demarcation of the labor market into submarkets. The process of vocational development operates from the supply side: the transition of individuals through the life stages of growth, exploration, establishment, maintenance and decline; development and reality testing of self-concept in the exploratory stage; implementation of self-concept in the trial and stable phases of the establishment stage; manifestation of the process of vocational development through a variety of career patterns. Labor market structure theory, on the other hand, stresses the institutional and economic factors which tend to partition the labor market broadly into the two substructures of external (the "outs") and internal (the 'ins') labor markets. Port-of-entry jobs interlink these markets and serve as evaluation districts for new initiates to internal markets.

The important observation to be made, then, is that the demand structure of the labor market is the analogue of the process of

vocational development. New initiates to the labor force attempt to implement their self-concepts through a variety of wo[illegible] experiences. In turn, the demand side of the labor market provides a number of job types, usually at the base of the occupational ladder, which operate as test sites. With advancement of age, education, work experience, skills and abilities, and a general focusing on self-concept, labor market behavior is increasingly orderly and patterned. Trial jobs with career potential, which have greater stability requirements, become available. Career patterns of women are intertwined with homemaking responsibilities; women are less stable labor force participants, in consequence. Job opportunities that lack stability requirements are available which conform to many female career patterns. Some individuals possess "multiple trial" and "unstable" career patterns; their work histories are disjoint and inconsistent. They become typed as unstable, and as a result, the doors to career jobs close and they are relegated to a particular low-level occupational substructure. There is, then, a good deal of conformance between the various career patterns and job availabilities. The conformance of employee and employer preferences through the interaction of vocational development with the demand structure of the labor market tends to create a variety of submarkets.

The job cluster concept is the basis for micro-analysis of the process of interoccupational mobility. A common "locus of attention" is the distinctive feature of a job cluster. Skills and abilities of workers in a given job cluster are correlative. Frequently, ladders of increasing responsibility develop within the situs; job classifications of less skill are logically related through promotion to those at the

top of the cluster hierarchy. Transferability of workers--the range of jobs which can be adequately performed by workers of a given skill--between jobs within the cluster is high. Also, within the job cluster, substitutability--the range of persons with varying skill levels who can adequately perform a given job--is high. Furthermore, the job cluster concept emphasizes the influence of technology. Whereas the general process of labor market accommodation is outlined by vocational development theory in conjunction with the demand structure of the labor market, the job cluster concept focuses more sharply on the specifics of that operation. Job clusters subdivide the submarkets. Thus the first-order dimension of the occupation system is the segmentation of the labor market into submarkets brought about by the interaction of institutional and economic forces with the vocational development process. The second-order dimension takes cognizance of the role of technology in furthering the compartmentalization of the occupation system. The first-order dimension will be referred to as the "submarket domain;" the second, the "situs domain."

Predictions Implications of OST

There are a number of predictions from OST that serve to foreshadow our expectations of structure in occupational mobility and also a number of implications that we can extract from the theory that have methodological relevance. Among the predictions we have: (1) Positive (upgrading) flows of workers within and between markets; (2) Proliferation of technological forms; (3) Technological domination of situs domains; (4) Situs domination of submarket domains; (5) Industry-oriented situs domains; (6) Skill-graded submarkets; (7) Female-type labor markets; (8) Special-knowledge-based markets;

(9) Secondary-worker markets; and (10) Late and possibly spurious associations of career-status occupations in mobility structure. There is, first, a general expectation from OST that mobility patterns will tend to exhibit a positive orientation, that is, movement up the skill-ladder. This expectation arises from the operation over time of the vocational development process along with the structural features of the demand side of the labor market.

Clusters of job categories that have somewhat similar and interactive mobility patterns should reveal the wide variety of technological forms of producing goods and services in an advanced economy such as the United States. Our prediction is that these diverse forms of technology will be in evidence in the situs domains and that the situs domains will tend to dominate the submarkets. Thus the job market is envisioned by OST to be, first, divided into submarkets which are further divided into situs. Submarkets have a class-of-worker orientation with general overtones such as unskilled, semiskilled, skilled, clerical, professional, and sales. Situs have a technological orientation such as machines, tools, research and design, and vehicle operation. The situs domain is, of course, conceptually narrower than the submarket domain. Promotion, transfer and substitution possibilities are greater within situs than within submarkets. Some situs domains are expected to be so narrow in terms of the specificity of the skills and abilities and, potentially, the type of good or service produced that they may be expected to stand alone in the occupational mobility structure. Health-care occupations are a prime example. Specificity implies narrower ranges of movement that would tend to produce this result.

With respect to the submarket divisions, the labor market structure aspect of OST leads to the expectation of skill-graded submarkets among the broader, or less specialized markets such as the blue-collar markets. Female-type submarkets are also a distinct possibility from what we know about the complexity of female career-patterns and the entwinement of these patterns with homemaking responsibilities. It would not be surprising to find these jobs closely related or integrated with secondary-worker type jobs that are linked to low-skilled service sector employment. Jobs that are based on the application of special forms of knowledge are expected to form distinct submarkets. Examples include teaching and engineering. Finally there is the possibility that an occupation is so specialized that it remains very distinct until the classification becomes very broad or the possibility that the mobility pattern is so diverse that it seems to cluster spuriously with other not seemingly related categories. General management might be of this form for the reason that management, as a late-entry occupation, tends to draw from a wide spectrum of occupations. In consequence, when people leave management occupations, their movements are often diverse, too.

In terms of implications, OST tells us that a highly detailed level of analysis is necessary if we expect to draw out the salient features of the job market from occupational mobility patterns. Furthermore, the expectation of structure in mobility patterns rises with age. Thus by restricting population to workers who (1) have completed their formal education and (2) have reached a stabilization phase of career behavior, we should be able to eliminate much of the random movements of the exploration stage as well as the spurious

movements associated with jobs held part-time or part-year while completing school. A final implication of OST in relation to the form of analysis is the need to integrate the micro characteristics of jobs with the mobility data. A more comprehensive assessment of the career functionings of the job market requires not only a delineation of the types of careers, but also an examination of the structural underpinnings of each career.

METHODOLOGY

Analysis of the structure of occupational mobility requires large amounts of data on mobility if a detailed category basis is employed. But more importantly, it requires the use of a consistent and systematic method of data reduction in order to uncover the key elements of structure that otherwise lie hidden in large data matrices. In this section such a methodology is proposed. There are five major steps in the methodology: (1) Creation of the mobility matrix; (2) Job characteristics weighting of mobility distributions; (3) Computation of measures of similarity, rather, dissimilarity, in weighted score values; (4) Clustering of dissimilarities data; (5) Decomposition of the clusters. Each major facet of the methodology is discussed below.

Mobility Matrix

Consider a matrix $M_{n \times n}$ containing in cell m_{ij} a simple count of the number of workers in the sample who moved from occupation i, the origin occupation, to occupation j, the destination occupation. Such a simple count matrix can be utilized to examine the process of mobility in several ways. Normalizing on the basis of rows we would have the egressive or out-distributions of workers. The m_{ii} cells, the retentions, could be dropped from the analysis, and when normalized the matrix would reflect probability distributions of mobile workers. Normalization on the basis of columns would produce ingressive distributions, or otherwise stated, the recruitment-dependence of category j on category i.

In this paper the egressive distribution form will be used exclusive of retentions. Diagonal cells of the matrix are set to zero prior to computation of the mobility matrix:

$$P_{n \times n} = [p_{ij}] = m_{ij}/m_{i\cdot}$$

where the "·" signifies summation over the index. The P-matrix is then the probability distributions of out-mobility from the various categories of mobile workers. Specification of the matrix in this form yields a special interpretation when combined with the next aspect of the methodology.

Mobility Weighting of Job Characteristics

Consider a matrix $C_{n \times p}$ of p-job characteristics on each of the n-occupations and a matrix $Z_{n \times p}$ which is a normalized form of C such that $Z'Z = R_{p \times p}$, the standard correlation matrix. The correlation matrix can be analyzed by the principal components method in order to extract the salient job dimensions from the data:

$$R_{p \times p} = E_{p \times p} \Lambda^{1/2}_{p \times p} \Lambda^{1/2}_{p \times p} E'_{p \times p} = F_{p \times p} F'_{p \times p}$$

where, $E_{p \times p}$ is the matrix of eigen vectors; $\Lambda_{p \times p}$ is a diagonal matrix of eigen values; and $F_{p \times p}$ is the factor loading matrix.[30] Some criterion for choice of the number of dimensions to be analyzed can be used, such as the eigen value of one criterion, to reduce the dimensionality to $p' < p$ so that:

$$R^{*}_{p \times p} = F_{p \times p'} F'_{p' \times p} \cong R.$$

Using an orthogonal transformation for rotation of the factor loadings matrix we can further highlight the salient dimensions as an aid to interpretation:

$$\tilde{F}_{p \times p'} = F_{p \times p'} T_{p' \times p'}$$

where $F_{p \times p'}$ is the rotated factor loadings matrix and $T_{p' \times p'}$ is the orthogonal transformation matrix. The factor scores matrix can be estimated from the relation

$$Z_{n \times p} = S_{n \times p'} \tilde{F}_{p' \times p}$$

to produce

$$\hat{S}_{n \times p'} = Z_{n \times p} \tilde{F}_{p \times p'} (\tilde{F}_{p' \times p} \tilde{F}_{p \times p'})^{-1}.$$

It is straightforward to show that the columns of $\hat{S}$ are orthogonal, that is,

$$\hat{S}_{p' \times n} \hat{S}_{n \times p'} = c\, I_{p' \times p'}$$

where, c is a scalar constant and I is a $(p' \times p')$ identity matrix.

An important step in the methodology is to combine the mobility distributions with the estimated factor score matrix to yield:

$$A_{n \times p'} = P_{n \times n} \hat{S}_{n \times p'}.$$

Thus in the matrix $A_{n \times p'}$ we have in the coefficient a_{ij} the average score for the mobile workers from category i on the j orthogonal dimension of the job characteristics variables. To illustrate the use of this format assume that each occupation has a unique wage, that all incumbents in a given occupation have the same wage, and that one of the dimensions of the job characteristics space is earnings. Would it not be true then that the appropriate a_{ij} cell would measure earnings attainment for the mobile workers out of category i? Of course other variables may show up as important along with earnings to form, possibly, a human capital dimension. The resulting matrix

multiplication to obtain $A_{n \times p'}$ would be a dimension reflecting the average human capital score.

It is important to note that the specification chosen for the P-matrix with zeroes in the main diagonal results in an A-matrix that does not reflect any of the characteristics of the base category. The scores obtained on any dimension reflect only those achieved by mobile workers.

Dissimilarities Matrix

The standard Euclidian distance metric will be used to assess the relative correspondence of mobility-weighted job dimensions between occupational pairs. The metric is defined as

$$D_{n \times n} = [d_{ij}] = [\sum_{k} (a_{ik} - a_{jk})^2]^{1/2}.$$

A primary advantage of this metric is invariance under orthogonal rotation. The D-matrix provides summary measures of the proximity of the occupations in the multidimensional average-mobility-scores space.

Cluster Analysis

There are about 38,000 dissimilarities measures for the analysis reported in this paper. This massive amount of information necessitates the use of a methodology capable of identifying the underlying patterns or structure that otherwise literally lies hidden in the D-matrix. Such identification is not evident from visual inspection alone. What is sought is a method which by some criteria optimally classifies the occupations into relatively homogeneous groups on the basis of the empirical measures of dissimilarity between occupational pairs. In my dissertation work I used the Johnson hierarchical

clustering method, diameter option.[31] The hierarchical approach systematically forms clusters of points, adds points to clusters, and combines clusters until all elements are in the same cluster. There is intuitive appeal to the notion of hierarchical clustering from the perspective of OST's situs/submarket domains.

The complete linkage or diameter approach tends to produce bias in the cluster representations from its inherent tendencies to form a large number of distinct clusters. Johnson (1967), in fact, describes the diameter method as producing optimally compact clusters. On the other hand, the single-link or connectedness method, another option of Johnson's algorithm, tends to produce long, stringy clusters. This tendency is called chaining. Thus the diameter method tends to be space-dilating, that is, in various regions of the multidimensional space the points appear to be drawn in towards one another and away from other regions. The single-link method is space-contracting: Points which do not appear to be close in the real space may appear in the same cluster representation.

Both the single- and complete-linkage methods have intuitive appeal and various alternatives such as mean or median linkage have been proposed as a middle ground. The two methods of hierarchical clustering also have the advantage of being invariant under monotonic transformations of the (dis)similarities data. Thus the D-matrix could be transformed to rank-order without any effect on the cluster representations. This feature is also available in some alternatives to commonly used methods. One seemingly would like to take advantage of the intuitive features of both the single- and complete-linkage methods while preserving the monotonic invariance feature.

The single-link method would appear to serve us best when the data exhibits a strong chain-like structure as would be the case with skill-graded job-ladders. Here the connecting links are strong but the direct ties between non-adjacent points of the chain are weak. Abstractly we would have:

A -----> B -----> C

where the alphabetic characters represent occupations, and the arrows indicate mobility relationships. We do not require mobility flows directly from A to C. A complete-linkage requirement may fail to identify such a chain relationship. On the other hand, when we address the subject of clusters, the intuitive notion of "clumps" of points in a multidimensional space comes to mind where there is at least some minimal degree of association between all pairs of points. This notion has appeal relative to the concepts of larger situs and submarket domains.

The single- and complete-link methods can be seen as endpoints of a zero-one scale. Midway in the scale we would have the median method requiring 50-percent connectedness. For example, using the median method we would first determine the total number of linkages (l_{ij}) possible when combining two clusters, C_i and C_j, with n_i and n_j members each:

$$l_{ij} = [(n_i + n_j)^2 - n_i - n_j]/2.$$

The number of linkages necessary (l^*_{ij}) such that the $C_i + C_j$ cluster would be at least 50-percent connected is:

$$l^*_{ij} = g\ (.5\ l_{ij})$$

where, $g(\cdot)$ is a function that converts a real number with a potentially fractional part to the next highest integer. Therefore, if $n_i = 6$ and $n_j = 8$, l^*_{ij} (median) = 46, and if $n_i = 7$ and $n_j = 9$, then l^*_{ij} (median) = 60. Let V_{ij} be a l_{ij} length vector containing the rank-ordered similarity coefficients for $C_i + C_j$. Then the l^*_{ij} element of V_{ij} is the value at which the $C_i + C_j$ cluster is merged. Notice that the formula can be generalized to read as:

$$l^*_{ij} = g(\alpha\, l_{ij})$$

where, $0 < \alpha \leq 1$. An α arbitrarily close to zero produces the single-link method; $\alpha = 1$, the complete-link method.

If we allow the α parameter to somehow vary systematically, it would seem possible to capture the unique advantages of both the single- and complete-link methods. In hierarchical clustering of n-objects, there are n-1 cluster representations. Letting k represent the current stage of clustering ($k = 1,\ldots,n-1$), we could, for example, choose $\alpha_k = k/n-1$ for linear pattern of change in the α parameter. If we choose to place greater emphasis on complete-linkage clustering, we can pick a $\alpha_k = (k/n-1)^{1/2}$. With this specification, at the mid-stage of clustering we would require the clusters to be at least 70.7 percent connected. A general format of the α_k parameter is:

$$\alpha_k = (k/n-1)^{1/\beta}$$

where, $0 < \beta < \infty$. A value of β arbitrarily close to zero would result in very heavy emphasis, even total reliance, on the single-linkage method, while arbitrarily large values of β would result in a strong reliance on the complete-linkage method throughout all stages of

clustering. Thus the formula for α_k is completely general in encompassing the endpoints of the single- and complete-linkage methods and in the pattern of emphasis placed on the two methods throughout various stages of clustering. This variable parameter method of clustering will be used in this study employing a $\beta = 2$ value.

Decomposition

A given cluster representation can be broken down into its component parts through examination of the mobility weighted factor scores. Means and variances of the scores along each job-characteristics dimension will provide a view of the underlying structure of homogeneity for each cluster. The simple steps in decomposition are then to: (1) identify the occupations in a cluster; (2) compute the mean group average score along each dimension; and (3) find those dimensions that have high mean absolute values. These dimensions are then important indicators of the underlying cluster structure.

Summary

The methodology for analysis of career functioning of the labor market is straightforward, compact, intuitive, and systematic. It makes use of job characteristics data, the micro-dimensions of the job market; it combines mobility distributions and the salient dimensions of jobs in an intuitive manner; it employs a cluster analytic strategy that has appeal in terms of presumed operations of the labor market and that generalizes the polar cases of the single- and complete-linkage methods; and, it uses a decomposition strategy that gives a view of the factors responsible for the clustering in the first place. Through use of the methodology we should obtain a clearer understanding of the career functionings of the job market.

DATA ELEMENTS

Occupational mobility data are derived from the 1970 Census of Population. A special mobility extract tape containing a 3 percent of the population basis (a combination of the three non-overlapping 1 percent county-groups, neighborhood-characteristics and state tapes). Both occupation in 1965 and occupation in 1970 were sampled in the 1970 Census enabling the computation of a five-year mobility matrix. Such a wealth of data is needed for examination of mobility on a detailed category basis. Both men and women who were listed as employed in both 1965 and 1970, who were between 25 and 54 years of age, who had at least five years of labor market experience in 1970 using the age minus education minus six criterion, and who were mobile as measured by a change in detailed Census occupation are included in the sample.

The principal source of job characteristics data is the Position Analysis Questionnaire (PAQ), augmented by variables computed directly from the 1970 Census. The PAQ data used in this study were obtained directly from PAQ Services, Inc. The PAQ data set consists of approximately 40,000 individual job analyses coded according to the Dictionary of Occupational Titles (DOT) classification scheme. There are 187 coded PAQ variables. A total of 95 variables were made available to me by PAQ Services, Inc. These variables were selected by me on the basis of factor analytic results of all variables, on the basis of economic theory as to important variables in wage determination, and on the basis of Occupation Systems Theory. Variables from all major divisions of the PAQ instrument are used: (1) Information input; (2) Mental processes; (3) Work output (physical activities, tools,

equipment and devices); (4) Relationships with other persons; (5) Job context; and (6) Other job characteristics.

The PAQ variables are arithmetic averages of the individual job scores on each PAQ variable. About 1,800 DOT codes are available. The DOT codes were reclassified into the 1970 Census three-digit occupational classification scheme and reaveraged. Three hundred Census codes are represented by the 1,800 highly detailed DOT codes available in the PAQ data base (about three-fourths the total number of titles in the Census scheme). The larger Census categories are well represented in the PAQ data base.

Additional variables, computed from the 1970 Census tapes, included mean earnings, standard deviation of earnings (a measure of risk), percent female, percent nonwhite, average age, average education, percent with vocational training, unemployment rate, and a 12-category industry/employment distribution. Estimates of percent union for each occupation were taken from a study by Freeman and Medoff (1979). A total of 117 jobs variables are used. Appendix I reports these variables, their means and their standard deviations.

Twenty-five lightly populated job categories were deleted from the analysis for lack of sufficient mobility. These categories were, however, included in the factor analytic results. The cluster analytic results are therefore based on a total of 275 categories.

EMPIRICAL RESULTS

Factor Analytic Results

Appendix II contains a summary list of large factor loadings for each of the 25 dimensions obtained from use of the eigen value "1" criterion. Occupations with large factor scores are reported for the first 12 dimensions to give additional insight into what these more important dimensions are capturing. The 25 dimensions account for 79 percent of the total variance. A few general comments on the factor analytic results are in order. The first dimension--decision, communication, and analytical responsibilities--reflects a complex integration of variables important to high-level white-collar and professional occupations. The general nature of this factor is indicated by factor loadings of an absolute value .5 or higher on 36 jobs variables. Also the variables that are negatively related to this dimension--hand/arm manipulation (-.57), unemployment rate (-.56), repetitive activities (-.53), and percent union (-.53)--reflect basic general divisions of the job market. In total, this dimension accounts for 20 percent of the variance.

The second dimension appears to be related to skilled use of tools and instruments; the third is associated with skills necessary for vehicle operation; and the fourth reflects unpleasant work environments that also present a possibility of physical impairment. These dimensions appear to be reflecting underlying structure among blue-collar jobs. Dimension 5, while explaining only 4 percent of the variance, captures the features of the secondary labor market: high factor loadings for percent female, percent nonwhite; large negative loadings for job-related experience, use of math, earnings variation, and mean

log earnings. Clerical and related activities are represented in Dimension 6; regular hours and regular work in Dimension 7. Of interest, occupations such as musicians, airline pilots, and flight engineers have very negative factor scores in Dimension 7. Remaining dimensions account for smaller proportions of variance (2 percent or less), and one-half of the remaining include at least one strong industry affiliation.

Mobility Clusters

Cluster analysis and cluster decomposition are the final stages of the methodology. These end-product results are concisely reported in this section. Variable-linkage hierarchical clustering, discussed above, with a β-value equal to 2 is used to identify mobility-related occupations. The $\beta = 2$ parameter value places increasing emphasis on the complete-linkage method as the stage of clustering approaches n-1, the final cluster stage where the last two distinct clusters are combined. We will examine the internal structure of the clusters using the first seven dimensions from the factor analytic results. These seven dimensions account for approximately two-thirds of the explained variation. Also, we will use the eighth-decile level, where hierarchical cluster is 80 percent complete, as a basis for a review of the results. There are 38 distinct clusters of two or more occupations at this stage of the hierarchical clustering. Clustering is sufficiently complete at this level to allow an overall view of the empirical results.

Appendix III provides a summary representation of the cluster analytic results. Titles of occupations are read vertically-down in these figures. The breadth of the cluster is identified by a series of

X's linking the titles. The value of cluster is a general measure of the internal consistency of a given cluster. Every eighth level is shown so as to produce a more compact representation. Vertical lines identify the clusters at the eighth-decile level.

The clusters of Appendix III demonstrate a wide-ranging variety of technologies and situs in the U.S. job market. Cluster 1 captures farm technology; Cluster 2, vehicle and heavy equipment operation; Cluster 3, less skilled blue-collar jobs with overtones of equipment operation; Cluster 4, machines; etc. Table I lists the average scores from the A-matrix for 9 of the 38 clusters that especially demonstrate the role of technology in the mobility clusters. Group average scores for each of the first seven dimensions are also presented. A machines and equipment job family, listed first in Table I, is shown to consist of a large number of operatives type blue-collar jobs. These jobs score very weakly on the decision making, communication, and analytical responsibilities dimension; strongly on the skilled use of tools and instruments dimension; very strongly on the unpleasant and hazardous environment dimension; and very weakly on the clerical and related skills dimension. A tools job family is shown in Cluster 12. It differs from the machines job family largely in that it appears to involve higher scores on both Dimension 1 and 2.

In Cluster 24 we see a general clerical cluster of occupations with membership consisting of file clerks, receptionists, typists and the like. Cluster 25 also appears to be a general clerical type cluster in the pattern of scores displayed. Yet, as indicated by the group average scores in Table II, the average mobility score on the secondary labor market factor dimension is more favorable while the

Table I

Average Mobility Scores
for
Selected Occupational Clusters

	Dimensions						
	1	2	3	4	5	6	7
Cluster #4							
SPINNERS ETC. TEXTILE OP	-0.60	0.12	-0.02	-0.02	0.18	-0.11	0.14
TEXTILE OPERATIVES NEC	-0.55	0.10	-0.06	0.23	0.17	0.05	-0.03
WEAVERS, TEXTILE OP	-0.45	0.23	-0.06	0.23	0.29	-0.10	0.04
STATIONARY FIREMEN	-0.52	0.07	-0.35	0.32	0.17	0.22	-0.08
CARDING ETC. TEXTILE OP	-0.56	0.21	-0.16	0.44	-0.04	-0.31	0.11
PAINTERS, MANUF ARTICLES	-0.47	0.25	-0.24	0.35	-0.07	-0.20	0.18
FURNACEMEN, SMELT, POUR	-0.53	0.14	-0.25	0.34	-0.17	-0.34	0.10
MOLDERS, METAL	-0.54	0.05	-0.18	0.39	-0.18	-0.28	-0.05
MIXING OPERATIVES	-0.44	0.03	-0.25	0.34	-0.15	-0.21	0.13
FILERS, BUFFERS ETC.	-0.50	0.11	-0.19	0.12	-0.05	-0.28	0.07
NOT SPECIFIED OPERATIVES	-0.51	0.05	-0.05	0.20	-0.01	-0.17	-0.04
CUTTING OPERATIVES, NEC	-0.47	0.06	-0.13	0.17	0.01	-0.16	0.05
MACHINE OP, MISC SPECIF	-0.45	0.11	-0.14	0.19	-0.03	-0.18	0.08
MISC OPERATIVES	-0.37	0.14	-0.12	0.18	-0.03	-0.13	0.03
ASSEMBLERS	-0.40	0.11	-0.02	0.12	0.03	-0.07	0.02
BOTTLING & CANNING OP	-0.46	-0.06	-0.17	0.16	0.08	-0.11	-0.04
MEAT CUT & BUTCHER, MANU	-0.47	0.01	-0.22	0.15	0.19	-0.03	0.02
FURNITURE & WOOD FINISH	-0.52	-0.02	-0.09	0.25	0.06	-0.30	0.04
RIVITERS AND FASTENERS	-0.58	0.16	-0.07	0.26	0.14	-0.24	-0.12
WINDING OPERATIVES, NEC	-0.45	0.28	0.16	0.17	0.15	-0.01	-0.08
PUNCH & STAMP PRESS OP	-0.51	0.24	0.05	0.16	-0.03	-0.27	0.06
DRILL PRESS OPERATIVES	-0.51	0.30	0.03	0.09	-0.03	-0.23	0.07
GRINDING MACHINE OP	-0.39	0.34	-0.08	0.14	-0.22	-0.25	0.05
FORGEMEN AND HAMMERMEN	-0.30	0.15	0.00	0.18	-0.44	-0.01	0.15
ROLLERS & FINISH, METAL	-0.38	0.29	0.08	0.53	-0.37	-0.35	0.09
HEAT TREATERS, ETC.	-0.35	0.04	-0.14	0.43	-0.30	-0.31	-0.13
GROUP AVERAGE SCORES	-0.473	0.135	-0.104	0.235	-0.025	-0.169	0.033
Cluster #12							
ELECT POWER LINEMEN	0.18	0.27	-0.39	0.50	-0.43	0.12	0.16
AIR COND MECH	0.10	0.33	-0.22	0.40	-0.45	-0.08	0.21
ELECTRICIANS	0.18	0.23	-0.32	0.27	-0.43	0.01	0.16
AIRCRAFT MECH	0.09	0.20	-0.28	0.16	-0.38	-0.01	0.12
RADIO AND TV MECHANIC	0.15	0.36	-0.29	0.16	-0.29	0.11	0.05
MISC MECHANIC & REPAIR	0.03	0.32	-0.34	0.24	-0.34	0.04	0.13
HOUSE APPLIANCE MECH	-0.00	0.20	-0.33	0.21	-0.33	0.02	0.17
AUTO BODY REPAIRMEN	-0.06	0.13	-0.58	0.09	-0.35	-0.21	0.23
AUTO MECHANICS	-0.08	0.24	-0.51	0.14	-0.35	-0.18	0.18
LOOM FIXERS	-0.05	0.31	-0.53	0.33	-0.23	-0.11	0.17
METER READERS, UTILITIES	-0.11	0.13	-0.30	0.23	-0.10	0.28	0.20
PHONE LINEMEN & SPLICERS	0.08	0.32	-0.37	0.06	-0.44	0.24	-0.06
GROUP AVERAGE SCORES	0.042	0.254	-0.371	0.232	-0.344	0.019	0.144

Table I(cont.)

	Dimensions						
	1	2	3	4	5	6	7
Cluster #24							
OFFICE MACH OP. N.E.C.	-0.22	-0.34	0.39	-0.24	0.26	1.06	0.22
TELEPHONE OPERATORS	-0.06	-0.51	0.48	-0.22	0.46	1.07	0.13
RECEPTIONISTS	-0.07	-0.58	0.55	-0.30	0.61	1.32	0.28
FILE CLERKS	-0.12	-0.62	0.50	-0.26	0.41	1.19	0.29
BILLING CLERKS	-0.12	-0.71	0.54	-0.26	0.44	1.41	0.35
NOT SPEC. CLERICAL WORK	-0.09	-0.64	0.57	-0.25	0.38	1.33	0.43
PAYROLL AND TIME CLERKS	-0.00	-0.63	0.52	-0.18	0.29	1.21	0.34
CALCULATE MACH OPERATORS	-0.16	-0.71	0.67	-0.27	0.42	1.53	0.42
BOOKKEEP & BILL MACH. OP	-0.20	-0.73	0.65	-0.32	0.48	1.59	0.35
SECRETARIES. LEGAL	0.09	-0.66	0.74	-0.24	0.55	1.76	0.49
STENOGRAPHERS	-0.09	-0.66	0.67	-0.29	0.69	1.86	0.48
TYPISTS	-0.03	-0.68	0.65	-0.23	0.60	1.56	0.36
SECRETARIES. MEDICAL	0.10	-0.51	0.65	-0.28	0.86	1.46	0.47
GROUP AVERAGE SCORES	-0.075	-0.614	0.582	-0.257	0.496	1.411	0.355
Cluster #30							
ARCHITECTS	0.65	-0.13	0.21	-0.26	-0.72	0.25	0.17
DESIGNERS	0.60	-0.11	0.14	-0.17	-0.73	0.10	0.12
CHEMISTS	0.65	-0.03	0.16	-0.08	-0.68	0.13	0.10
MECHANICAL ENGINEERS	0.65	-0.07	0.03	0.01	-0.85	0.00	0.06
METAL & MATERIAL ENGIN	0.80	-0.10	0.06	-0.02	-1.06	-0.04	0.16
CHEMICAL ENGINEERS	0.89	-0.30	0.11	-0.02	-1.04	-0.15	0.11
ELECTRICAL ENGINEERS	0.73	-0.18	0.10	-0.03	-0.87	0.00	0.04
INDUSTRIAL ENGINEERS	0.78	-0.29	0.14	0.00	-0.80	-0.03	0.14
COMPUTER PROGRAMMERS	0.83	-0.40	0.21	-0.09	-0.72	0.05	0.13
OP & SYSTEMS RESEARCH	0.69	-0.42	0.20	-0.12	-0.73	0.09	0.12
GEOLOGISTS	0.75	-0.43	0.06	-0.08	-0.73	-0.10	0.16
GROUP AVERAGE SCORES	0.729	-0.223	0.127	-0.078	-0.813	0.028	0.120
Cluster #32							
SALES MAN & HEADS RETAIL	0.43	-0.36	0.03	-0.13	-0.48	0.12	-0.09
SALESMEN. SERVICE & CONS	0.48	-0.38	-0.01	-0.10	-0.44	0.08	-0.18
BUYERS. WHOLE & RETAIL	0.68	-0.46	0.10	-0.01	-0.64	0.06	0.06
SALES REPS. WHOLESALE	0.55	-0.49	-0.14	-0.09	-0.88	-0.08	-0.26
SALES REPS. MANUF INDUST	0.60	-0.59	-0.04	-0.06	-1.01	-0.11	-0.43
GROUP AVERAGE SCORES	0.546	-0.456	-0.013	-0.079	-0.690	0.014	-0.180

Table I(cont.)

	Dimensions						
	1	2	3	4	5	6	7
Cluster #34							
PSYCHOLOGISTS	1.00	-0.33	0.24	-0.57	-0.14	-0.11	-0.01
VOCATION & ED COUNSELORS	0.97	-0.26	0.30	-0.60	-0.14	-0.09	0.11
TEACH C & U NO SPECIFIED	0.94	-0.13	0.37	-0.35	-0.10	-0.13	0.07
SCHOOL ADMIN. ELEM & SEC	1.03	-0.16	0.28	-0.39	-0.01	-0.07	0.08
SECONDARY SCHOOL TEACHER	1.10	-0.15	0.20	-0.47	0.14	0.06	0.09
GROUP AVERAGE SCORES	1.008	-0.207	0.277	-0.475	-0.053	-0.071	0.068
Cluster #35							
THERAPISTS	0.91	-0.07	0.20	-0.48	0.52	-0.23	0.01
WELFARE SERVICE AIDES	0.80	-0.09	-0.00	-0.20	0.58	0.01	0.09
HEALTH ADMINISTRATORS	0.72	-0.06	0.12	-0.39	0.07	0.03	0.06
SOCIAL WORKERS	0.86	-0.32	0.19	-0.29	-0.03	0.01	0.09
RECREATION WORKERS	0.90	-0.39	0.13	-0.30	0.12	-0.12	0.11
CLERGYMEN	0.67	-0.18	0.07	-0.31	-0.04	-0.17	0.15
ADULT EDUCATION TEACHERS	0.62	-0.09	0.12	-0.30	-0.20	0.13	0.09
TEACH. EXC C & U. N.E.C.	0.71	-0.01	0.05	-0.32	0.15	0.13	0.02
GROUP AVERAGE SCORES	0.774	-0.150	0.111	-0.325	0.145	-0.028	0.080
Cluster #37							
RADIOLOGIC TECHNOS	0.60	0.07	0.17	-0.39	0.47	0.22	-0.02
CLINICAL LAB TECHNOS	0.61	0.26	0.16	-0.56	0.41	-0.02	0.04
HEALTH TECHNOS. N.E.C.	0.71	0.30	0.17	-0.71	0.47	-0.17	-0.36
GROUP AVERAGE SCORES	0.640	0.210	0.168	-0.552	0.452	0.009	-0.113
Cluster #38							
PRACTICAL NURSES	0.35	0.21	0.06	-0.47	1.21	-0.10	-0.02
NURSING AIDES. ETC.	0.06	0.13	0.04	-0.24	0.99	-0.01	-0.02
HEALTH AIDES EXC NURSING	0.10	0.06	0.30	-0.41	0.87	0.30	-0.02
GROUP AVERAGE SCORES	0.170	0.133	0.135	-0.372	1.026	0.064	-0.017

group average score is somewhat lower for Cluster 25, but still high on the clerical dimension. A research and design type of job family is illustrated by Cluster 30. This cluster contains a number of engineering and design occupations along with chemists and geologists. Education and social welfare job families appear in Clusters 34 and 35; high-level sales in Cluster 32; and, health technology in Clusters 37 and 38.

There are several other, sometimes more specific technological types of job families shown in the clusters. A machine-tool trades cluster is seen, for example, in Cluster 9. A food service job family appears in Cluster 23. Three points: First, the varying techniques of production, the technical foci of jobs, appears to dominate the cluster representations. There are exceptions. Cluster 22 consists of seven occupations that seem to lack in an intervening technology, which may, in fact, be a principal problem in that these jobs tend to score relatively high on the secondary labor market dimension. In general, nevertheless, there is a strong technical orientation to a large majority of the clusters. Second, there appears to be a sizeable number of technical orientations of work. This may help explain why occupational classification has proven over the decades to be such an intractable problem.[32] Third, and foremost, many of the identified clusters we see are illustrations of principal technological divisions contained in Scoville's job family classificatory scheme.[33] Tools, machines, vehicle operation, sales A (considerable knowledge of product), sales B (limited product knowledge), research and design, education and social welfare, health service, inspection, protective service, personal service, entertainment, and administrative job

families are Scoville's terms for principal technological divisions of the job market. The methodology has not reproduced Scoville's scheme exactly. However, one would have to be extremely unreceptive to the possible role played by technology in the job market not to see the strong undercurrents of Scoville's theoretical framework in the cluster representations.

The 38 clusters provide evidence that the job cluster concept of OST, with its emphasis on technology and situs, is an important facet of occupational mobility interactions. Submarket domains, which can be viewed as super-clusters, are less evident without further summarization and highlighting, however. Table II provides the group-average mobility scores for each of the 38 clusters and, thus, a basis for examining submarket domains. If we divide the group average scores along each dimension into about four equal parts or quartiles and use '+' and '-' symbols to represent the quartiles, we have a summary view of Table II. In Table III there are nine values for the first quartile (++); ten for the second (+); ten for the third (-); and, nine for the fourth (--) and lowest group average scores.

Examination of Table III reveals distinct patterns of runs or strings of common quartile scores along the various dimensions. Successive common quartile scores along a dimension with a run length of three or more clusters are not uncommon. For example, for Dimension 1, a string of nine occupations has a quartile score of "--". Also, a string of nine occupations, Clusters 29 through 37, have a common quartile score of "++". Interactions among the dimensions can be seen by reading across the rows of the table looking for composite intersections of common quartile scores among the dimensions. Allowing for

Table II

Group Average Dimension Scores

Cluster Number	Dimensions						
	1	2	3	4	5	6	7
1	-.379	-.073	-.544	.267	.000	-.308	.213
2	-.524	-.254	-.929	.254	-.207	-.265	.260
3	-.495	-.064	-.477	.350	-.115	-.233	.160
4	-.473	.135	-.104	.235	-.025	-.169	.033
5	-.241	.006	-.031	.128	-.057	-.034	.059
6	-.303	-.267	-.401	.059	-.039	.005	.107
7	-.263	-.126	-.022	-.030	.358	-.171	-.021
8	-.470	-.066	.097	.065	.479	-.163	-.033
9	-.330	.446	.014	.062	-.314	-.246	.102
10	-.204	.294	-.295	.424	-.259	-.182	.224
11	.010	.411	-.033	.346	-.436	-.175	.168
12	.042	.254	-.371	.232	-.344	.019	.144
13	.227	-.029	.001	-.168	-.174	.218	-.096
14	.326	-.335	.034	-.051	-.181	.211	.066
15	.337	-.094	.128	-.218	-.206	.223	-.003
16	.308	-.164	-.485	.113	-.458	.005	.260
17	.446	-.326	-.573	.251	-.049	.105	-.019
18	.388	.131	.061	-.089	-.520	.165	.028
19	.019	.215	.116	.009	-.496	-.109	.066
20	.143	.002	-.185	.267	-.417	-.021	.099
21	.084	-.249	-.329	.078	-.084	.172	.068
22	-.110	-.298	.187	-.128	.345	.454	-.008
23	-.004	.097	.261	.067	.684	.093	-.335
24	-.075	-.614	.582	-.257	.496	1.411	.355
25	.135	-.591	.462	-.225	.164	.950	.275
26	.287	-.444	.354	-.129	.204	.659	.121
27	.339	-.316	.460	-.451	.526	.802	.336
28	.510	-.604	.363	-.149	-.251	.569	.257
29	.665	-.476	.116	-.112	-.484	.119	.060
30	.729	-.223	.127	-.078	-.813	.028	.120
31	.575	-.193	-.233	.063	-.522	.088	.094
32	.546	-.456	-.013	-.079	-.690	.014	-.180
33	.910	-.542	.039	-.019	-.714	-.108	.097
34	1.008	-.207	.277	-.475	-.053	-.071	.068
35	.774	-.150	.111	-.325	.145	-.028	.080
36	.684	.249	.291	-.575	-.387	.101	-.009
37	.640	.210	.168	-.552	.452	.009	-.113
38	.170	.133	.135	-.372	1.026	.064	-.017

Dimension Legend:
1) Decision, communication, analytical responsibilities; 2) Skilled use of tools and instruments; 3) Vehicle operation job elements; 4) Work in unpleasant, hazardous environment; 5) Secondary labor market; 6) Clerical and related activities; 7) Regular hours, regular work.

Table III

Quartile Ranks of Group Average Dimension Scores[1]

Cluster	Dimensions						
	1	2	3	4	5	6	7
1	--	+	--	++	+	--	++
2	--	-	--	++	-	--	++
3	--	+	--	++	+	--	+
4	--	++	-	++	+	--	-
5	--	+	-	+	+	-	-
6	--	-	--	+	+	-	+
7	--	+	-	-	++	--	--
8	--	+	+	+	++	--	--
9	--	++	-	+	-	--	+
10	-	++	--	++	-	--	++
11	-	++	-	++	--	--	++
12	-	++	--	++	-	+	+
13	+	+	-	-	-	++	--
14	+	--	-	-	-	++	-
15	+	+	+	--	-	++	--
16	+	-	--	+	--	-	++
17	+	--	--	++	+	+	--
18	+	+	+	-	--	+	-
19	-	++	+	+	--	-	-
20	-	+	-	++	-	-	+
21	-	-	--	+	+	+	-
22	-	-	++	-	++	++	-
23	-	+	++	+	++	+	--
24	-	--	++	--	++	++	++
25	-	--	++	--	+	++	++
26	+	--	++	-	++	++	+
27	+	-	++	--	++	++	++
28	+	--	++	-	-	++	++
29	++	--	+	-	--	+	-
30	++	-	+	-	--	+	+
31	++	-	-	+	--	+	+
32	++	--	-	-	--	-	--
33	++	--	+	+	--	-	+
34	++	-	++	--	+	-	-
35	++	-	+	--	+	-	+
36	++	++	++	--	-	+	-
37	++	++	+	--	++	-	--
38	+	++	+	--	++	+	--

[1]Symbols for the quartile levels are:
First quartile (++); Second (+); Third (-); and Fourth (--).

Dimension Legend:
1) Decision, communication, analytical responsibilities; (2) Skilled use of tools and instruments; 3) Vehicle operation elements; 4) Work in unpleasant, hazardous environment; 5) Secondary labor market; 6) Clerical and related activities; 7) Regular hours, regular work.

overlap between submarket domains, that is, for the possibility that one cluster may bridge two submarket domains, super-clusters can be identified by delineating common patterns among the dimensions. One such super-cluster is composed of three clusters: 1. farm; 2. vehicle and heavy equipment operation; and, 3. lower-skilled freight handling and laboring occupations. These clusters are similar in terms of Dimensions 1, 2, 4, and 6, that is, quartile scores are identical on these dimensions. The super-cluster, thus, can be described as consisting of occupations that score very negatively on the decision making, etc., dimension; very negatively on the vehicle operation dimension (note: Dimension 3 is a negative dimension; occupations high in vehicle operation skills score negative values); very strongly on the unpleasant and hazardous environment dimension; and very negatively on the clerical dimension. Notice, also, that quartile scores on the other three dimensions (2, 5, 7) are somewhat consistent although not equal.

A compilation of other super-clusters is presented in Table IV. In total, 13 super-clusters and 2 bridging clusters are identified for expository purposes. These divisions are somewhat artificial in that other combinations could be identified and in that the super-clusters tend to shade into one another rather than sharply divide. Nevertheless, the gray-shaded boundaries of submarket domains are apparent. Among blue-collar jobs (Clusters 1-12) there is general consistency in lack of positive association with the decision making, communications, and analytic responsibilities dimension and the clerical and related skills dimension. Some of the categories are closely associated with skilled use of tools and instruments and vehicle operation. The

Table IV

Dominant Characteristics of
Submarket Structure Clusters

Super-Cluster	Cluster	Group Dimension Score Quartile Dimensions						
		1	2	3	4	5	6	7
1	1, 2, 3	—		--	++		--	
2	3, 4, 5, 6	—				+		
3	7, 8	—				++	--	
4	9	—	++	-	+	-	--	+
5	10, 11, 12	-	++		++			
6	13, 14, 15	+					++	
7	16, 17, 18	+						
8	19, 20, 21	-						
9	22, 23, 24	-		++		++		
10	24, 25		--	++			++	
11	26, 27, 28	+		++			++	
12	29, 30, 31	++				--	+	
13	32, 33, 34	++					-	
14	35	++	++	+	--	-	+	+
15	36, 37, 38		++		--			

general pattern of some association with these two dimensions is apparent, although out of the 12 blue clusters only two clusters are strongly (++) associated with each of these two general dimensions. An unpleasant and hazardous environment is also descriptive of many of these clusters. In addition, there is a general tilt toward the secondary labor market, and for two clusters (7 and 8) the attachment to the secondary labor market is strong. No consistent pattern is revealed in the regular hour and regular work dimension. In summary, the general pattern of group average scores suggests the existence of a submarket domain of blue-collar among Clusters 1-12. There is variation in score patterns; some clusters show greater attachment to skilled use of tools and instruments while others are more closely associated with vehicle operation job elements. But the pattern is present, nonetheless.

Clusters 13, 14, 15 form a submarket domain of occupations that are more favorably inclined on the first dimension; that are negatively associated with secondary labor markets; and that involve clerical and related activities. The occupations include salesmen and sales clerks, retail trade; managers and administrators; expeditors and production controllers; certain agents; and, writers, artists and entertainers. Some occupations do not, a priori, appear to be properly classified, such as decorators and window dressers. Yet in their pattern of occupational mobility people in this occupation have commonalities with the other occupations in the cluster. This reveals that what matters is not necessarily what an occupation is, but what channels of mobility are open to its incumbents.

For Clusters 16, 17, 18 and 19, 20, 21 there is only one dimensional commonality: "+" for the former and "-" for the latter on

Dimension 1. These clusters appear to be specialized clusters. Specialization is logically opposed to transferability and substitutability and leads to more compact domains. Engineering and science technicians occupations are represented in Cluster 18. Generally there is some indication of intermediate-to-high technical content in these clusters.

Clusters 22, 23, and 24 have identical quartile scores on Dimensions 1, 3, and 5. These clusters are lower-level entry occupations, food service, and general clerical. They are alike principally in being negatively linked to the decision making, etc., dimension; not related to vehicle operation; and closely associated with the secondary labor market. Cluster 24 is very similar to Cluster 25 in quartile scores, only Cluster 25 is not as closely related to the secondary labor market. Clusters 26, 27, and 28 score positively on Dimension 1, a primary distinguishing characteristic because their quartile scores on the vehicle operation and clerical dimensions are similar to those obtained for Clusters 22-25. Clusters 26 and 27 are also closely associated with the secondary labor market dimension. A notable pattern of low scores is apparent on the unpleasant and hazardous environment dimension for occupations 24-28. These occupations tend to have more agreeable work environments.

Beginning with Cluster 29 we see a broad class of the more professional types of employment. Clusters 29, 30, and 31 agree on Dimension 1 (++), 5 (--), and 6 (+). Clusters 29-33 agree on Dimensions 1 and 5. These categories then score very high on decision making, communication and analytical responsibilities and are only distantly related to the secondary labor market. Clerical and related

skills are somewhat necessary for 29-31; the job environment is essentially neutral if not somewhat unpleasant; association with skilled use of tools and instruments is low. A submarket structure of agents, inspectors, and engineers is found by these clusters. Cluster 32, 33, and 34 are alike on two dimensions (1 and 6). Cluster 35 (social welfare) is a bridge in that it has a pattern of quartile scores similar to Cluster 34 while it is also closely linked to Clusters 36-38. In Clusters 32-38 we have high-level sales, education, social welfare, and health technology occupations. Contrasts among these groups involve skilled use of tools and relationships to the secondary labor market. The health technology occupations tend to score positively on both of these dimensions. Job environment is, however, generally pleasant. Also, there is some tendency for irregular hours and work among these clusters.

Decomposition of the clusters has proved to be a useful exercise both for furthering understanding of the internal structure of clusters and delineating submarket structures. It also provides a check on the internal consistency of clusters. Consistency in patterns of quartile scores on the first seven dimensions has been used to examine submarket structures. Several principal divisions have been found including (1) blue-collar, (2) specialized, (3) secondary, (4) clerical, and (5) professional. There are substantial differences within these broad classes making summarization somewhat futile. There are at times subtle differences distinguishing the broad submarket structure. There is overlap of distinguishing characteristics. Nevertheless, our understanding of career functioning of the job market appears to be enhanced through assessment of similarity in occupational mobility patterns.

CONCLUSION

This paper has presented a systematic methodology for assessing career functioning of the job market through occupational mobility. The methodology consists of several stages of analysis including: (1) construction of a detailed category occupational mobility matrix; (2) principal components analysis of job characteristics data; (3) mobility weighting of the principal dimensions of job characteristics; (4) formation of a distance matrix based on average mobility scores; (5) hierarchical cluster analysis of the distance matrix using a more general variable linkage approach; (6) decomposition of cluster analysis results to enhance understanding of those factors most responsible for the clustering; and, (7) an appraisal of general factor interactions to further understanding of submarket domains. In the first five steps, information is systematically combined to produce a parsimonious description of the data. The final steps divulge the elements of commonality in the cluster configurations.

Occupation Systems Theory (OST) provides the conceptual basis for the approach. As a synthesis of various aspects of economics, psychology, and sociology, this theoretical framework provides a more comprehensive view of the career functionings of the job market. It is not totally comprehensive, just more comprehensive. The totally comprehensive framework may be an impossibility. The role of OST is to foreshadow what we expect to see in the occupational mobility structure.

Several of the predictions of OST bear fruit in the empirical analysis of 275 detailed Census occupational categories and 117 job characteristics variables. These include: (1) a proliferation of technological forms of production; (2) a technological domination of

situs domains; (3) situs domination of submarket domains; (4) industry-oriented situs domains; (5) skill grades within submarket domains; (6) female-type labor markets; (7) special-knowledge-based markets; (8) secondary labor markets; and (9) late and apparently spurious associations of career-status occupations. A final prediction is a positive or upgrading flow of workers within and between markets. This prediction is not tested in this paper because it requires specific analysis of mobility coefficients.[34] The remaining implications of the theory are reflected to varying degrees in the empirical results. The first implication appears to be well documented in the cluster representations. Technological-form appears to be the guiding rationale for the early stages of clustering. Many such clusters merge to form situs domains such as health care technology, which again forms at still higher levels of aggregation into submarket domains, such as professional/technical occupations.

A few industry-oriented situs are apparent such as textile workers. Skill grades within submarkets, for example, machine-tool occupations in the blue-collar markets, are in evidence. Jobs with a lack of intervening technology and with particular attachments to the secondary labor market dimension are also found. Many of the jobs that have a high percentage of female incumbents are closely aligned with the secondary dimension. Special-knowledge-based markets such as engineering and science are also identified by the methodology. And we see that some high-level career-specific occupations such as lawyers and physicians cluster late in the process. This can lead to spurious associations because of the uniqueness of their mobility distributions.

Fundamental to the approach of Occupation Systems Theory is the notion that we cannot separate the supply facets of vocational development theory from the demand aspects of labor market structure theory when analyzing career functioning of the job market. To use an old analogy, "you cannot tell which blade of the scissors is doing the cutting." For example, do female labor markets exist because these jobs are more accommodating to the more complex career patterns of women? Or, do women suffer from categorical discrimination from the demand-side of the market, and are they denied better opportunities because of their more complex career patterns? The answer to both questions is: Yes! Vocational development and labor market structure are two sides of the same coin. Analysis of the career functioning of the labor market requires that both facets and, more importantly, their interaction be examined.

Analysis of occupational mobility patterns is an effective way to examine the interaction of the two main bodies of theory. The job cluster concept demarcates the various technologies in the job market, some of which are more suited to particular career patterns than others. Technology appears to play an important role in the career functionings of the labor market. All too often in our theoretical and empirical work we tend to neglect this role. Our research suffers from this inattention to this key aspect of the functionings of labor markets. The likelihood of further advances in career analysis is diminished unless we strive to incorporate more fully the technologies of the job market into our research.

FOOTNOTES

[1]Robert C. DauffenBach, The Structure of Occupational Mobility in the U.S. Economy, CAC Document No. 103 (Urbana, Illinois: Center for Advanced Computation, University of Illinois, 1973).

[2]The methodology was neutral in the sense that it automatically identified clusters of occupations thus forming a typology of jobs without the use of preconceived notions as to the factors that are important in producing cohesion among various job categories.

[3]James G. Scoville (1969B, p. 15) presents the following illustrative examples of the "promotional" aspects of careers:

> The first step below a job, in terms both of promotion and of content, is often one of "assistant" or "helper." Machinists' helpers generally provide materials, clean up the workplace, and perform lower-skilled jobs to expedite the work of the craftsman. Usually, the focus of a helper's job is the same as that of the man he helps, being involved with the same materials, equipment, and processes. Numerous cases could be cited of job clusters about large industrial machines: for example, the melters' and helpers' jobs associated with an open hearth, ranging from the foreman to the cinder pitman. Similar is the hierarchy of jobs found in a rolling mill--with the roller at the top, next, his assistant, and then the jobs of finisher, speed operator, and rollhand, among others. A further example of a promotion ladder is found on the railroads, where new operating employees are generally hired as firemen or brakemen and are promoted to engineers and conductors. These groupings and ladders are exemplary of the job family on the micro-economic level of the operating unit.

[4]John T. Dunlop (1966) illustrates the role of technology or common production function in forming a job cluster of machine tool occupations and, in addition, emphasizes the importance of similarities in training and skill requirements and proximity within the work establishment:

> The training and skill of the machinists who operate the various specialized machines--lathes, shapers, cutters, and so on--are similar. Their work is closely interrelated in the productive process. They may work together apart from others. They may have common promotion, transfer and layoff pattern. The wage rates within the tool room are more closely related to each other than they are to the rates for other employees in the power plant--on production lines, in the maintenance crew, in the office or in the sales force.

[5]For a review of occupational choice theories see Zaccaria (1970).

[6]See J.L. Holland (1973), G.D. Gottfredson (1976) and L.S. Gottfredson (1978) for discussions.

[7]Zaccaria (1970), p. 37.

[8]See Montagna (1977) for a general discussion of social stratification and its interaction with the labor market. Blau and Duncan (1967) contains further material on social stratification, and Hauser and Featherman (1977) report results from several empirical studies.

[9]See Lenski (1966) for more discussion of conflict theory.

[10]Sommers (1979), p. 27.

[11]See Marcia Freedman, Labor Markets: Segments and Shelters (1976).

[12]See Cain (1976) and Wachter (1974) for neoclassically-based critiques of segmented market theories. Edwards, Reich, and Gordon (1973) contains several articles on the subject of labor market segmentation including modifications of the segmentation approach by Piore. Doeringer and Piore (1971) is one of the major initial works espousing the modern segmentationists viewpoint.

[13]The influence of the neoinstitutionalist school of labor economics on segmented labor market theorists is noted by Cain (1976, p. 1227).

[14]Duane Leigh (1978) has performed a considerable amount of research in this domain.

[15]Super (1957), Careers, p. 112.

[16]Ibid, p. 131.

[17]Ibid, p. 147.

[18]Ibid, p. 155.

[19]Ibid, pp. 73-74.

[20]Ibid, pp. 76-77.

[21]Clark Kerr (1954), p. 101.

[22]John T. Dunlop (1966), p. 32.

[23]Robert E. Livernash (1957), p. 149.

[24]James G. Scoville (1969A), p. 80.

[25]Ibid, p. 81.

[26]Ibid, p. 82.

[27]Paul K. Hatt (1950).

[28]James G. Scoville (1969B).

[29]J. McCormick and J. Tiffin (1974), Chapter III.

[30]The reader is referred to Rummel (1970) for a discussion of the principal components technique.

[31]S.C. Johnson (1967). Also see Sneath and Sokal (1973), pp. 215-245 for a discussion of cluster analysis and alternatives to the diameter and connectedness methods in Johnson's algorithm.

[32]See James G. Scoville (1966), Hodge and Siegel (1966), and Cain, Hansen, and Weisbrod (1966) for discussions of occupational classification problems. Also see DauffenBach (1973), Chapter IV.

[33]James G. Scoville (1969B).

[34]Such analysis is reported in DauffenBach (1973), Chapter VII.

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Appendix I

Job Characteristics Variables

	Variable	Mean	Standard Deviation
1.	Written materials	3.1043	1.0900
2.	Quantitative materials	2.2510	1.0433
3.	Pictorial materials	1.9042	1.1446
4.	Patterns/Related devices	0.8801	0.7685
5.	Visual displays	1.8496	1.1889
6.	Measuring devices	1.8282	1.2489
7.	Man-made features of environment	0.9955	1.0156
8.	Art or decor	0.4946	0.7888
9.	Verbal sources	3.6641	0.7569
10.	Near visual differentiation	3.1967	0.5729
11.	Far visual differentiation	2.0663	1.0931
12.	Color perception	1.8227	1.0768
13.	Sound pattern recognition	1.1936	1.0630
14.	Judging condition/quality	1.2982	1.0495
15.	Inspecting	2.6278	1.0132
16.	Decision making	2.8113	0.8228
17.	Reasoning in problem solving	2.8473	0.8144
18.	Combining information	1.8594	1.3325
19.	Analyzing information or data	2.0511	1.2898
20.	Compiling	2.0733	1.3131
21.	Coding/Decoding	1.3726	1.0131
22.	Transcribing	1.8270	1.0155
23.	Education	2.2271	1.0467
24.	Job-related experience	2.1297	1.0683
25.	Training	2.5117	0.9624
26.	Using mathematics	2.4371	0.8165
27.	Precision tools/instruments, manually powered	0.6165	0.8110
28.	Nonprecision tools/instruments, manually powered	1.8714	1.3434
29.	Long-handle tools, manually powered	0.7759	0.8693
30.	Handling devices/tools, manually powered	0.8013	0.9063
31.	Precision tools/instruments, powered	0.5603	0.7763
32.	Nonprecision tools/instruments, powered	1.0809	1.1790
33.	Drawing and related devices	1.6067	0.9872
34.	Applicators	0.9538	0.9288
35.	Measuring devices	1.7874	1.2721
36.	Technical and related devices	0.8915	0.9317
37.	Machines/Equipment	1.8478	1.2293
38.	Keyboard devices	1.4140	1.2988
39.	Hand-operated controls	1.1248	1.0625
40.	Foot-operated controls	0.8757	1.0057
41.	Powered highway/rail vehicles	1.0358	1.1664
42.	Powered mobile equipment	0.5304	0.8434
43.	Man-moved mobile equipment	0.6829	0.7409
44.	Operating equipment	0.5757	0.8148

Appendix I -- Continued

Variable	Mean	Standard Deviation
45. Remote-controlled equipment	0.3255	0.5512
46. Setting-up/Adjusting	1.4095	1.1544
47. Manually modifying	1.0820	0.8891
48. Material controlling	0.8673	0.9476
49. Assembling/Disassembling	1.2249	1.1373
50. Arranging/Positioning	1.5006	0.9125
51. Physical handling	1.6651	1.0682
52. Balancing	1.2349	1.1023
53. Level of physical exertion	2.3819	0.8386
54. Sitting	2.2244	1.1951
55. Finger manipulation	2.1336	1.0660
56. Hand/Arm manipulation	2.4505	1.1183
57. Hand/Arm steadiness	1.4848	1.0750
58. Eye-hand/foot coordination	1.9575	1.1039
59. Limb movement without visual control	1.4151	0.9355
60. Advising	1.8095	1.4161
61. Negotiating	1.2263	1.1778
62. Persuading	1.4914	1.3440
63. Instructing	1.9448	1.1265
64. Interviewing	0.9690	1.1634
65. Nonroutine information exchange	1.6105	1.2892
66. Writing	1.5432	1.3637
67. Entertaining	0.1777	0.5904
68. Serving/Catering	0.4548	0.9449
69. Personal contact with buyers	0.4264	0.6573
70. Personal contact with public customers	0.7095	1.0474
71. Personal contact with the public	0.8643	1.0573
72. Personal contact with students/trainees/apprentices	1.3884	0.9830
73. Personal contact with clients/patients/counselees	0.6824	1.0817
74. Supervision of nonsupervisory personnel	0.6795	0.8025
75. Direction of supervisory personnel	0.2318	0.4619
76. Out-of-door environment	1.0586	1.1237
77. High temperature	0.5873	0.7927
78. Low temperature	0.2475	0.3963
79. Air contamination	0.8830	0.9212
80. Dirty environment	1.0088	1.1019
81. Noise intensity	3.1069	0.7224
82. Permanent partial impairment	0.9305	0.6816
83. Permanent total disability/death	0.8179	0.6733
84. Strained personal contacts	1.1414	1.0864
85. Business suit or dress	0.3486	0.3764
86. Licensing/certification required	0.2303	0.2869
87. Regular work	0.9443	0.1536
88. Regular hours	0.7866	0.2712
89. Typical day hours	0.7724	0.2845
90. Repetitive activities	1.9292	0.9598

Appendix I -- Continued

	Variable	Mean	Standard Deviation
91.	Vigilance	1.8986	1.0135
92.	Updating job knowledge	2.6138	1.1417
93.	Responsibility for the safety of others	1.7133	1.0699
94.	Responsibility for material assets	2.9326	0.9314
95.	General responsibility	2.7861	0.9783
96.	Log mean earnings	1.9405	0.4047
97.	Standard deviation of earnings	4.0900	1.8555
98.	Percent female	0.2933	0.3084
99.	Percent nonwhite	0.0941	0.0789
100.	Average age	41.2164	4.5242
101.	Average years of education	11.8182	2.1904
102.	Percent vocational training	0.2973	0.1438
103.	Agriculture industry	0.0237	0.1251
104.	Mining industry	0.0154	0.0859
105.	Construction industry	0.0569	0.1621
106.	Durable goods industry	0.1810	0.2667
107.	Nondurable goods industry	0.1176	0.2252
108.	Transportation, communication, utilities	0.0925	0.2089
109.	Wholesale trade	0.0295	0.0840
110.	Retail trade	0.0822	0.1905
111.	Finance, insurance, real estate	0.0496	0.1600
112.	Business and repair services	0.0380	0.0783
113.	Personal and recreational services	0.0392	0.1425
114.	Professional services	0.1824	0.3067
115.	Public administration	0.0920	0.2061
116.	Unemployment rate	0.0336	0.0272
117.	Percent union	0.2437	0.2070

Appendix II

Summary Rotated Factor Loadings and Factor Scores by Dimension

1. Decision, communication, analytical responsibilities (20 percent of variance)

Large Factor Loadings

1.	Advising	.926
2.	Non-routine information exchange	.910
3.	Combining information/data	.909
4.	Decisionmaking responsibility	.896
5.	Reasoning in problem solving	.894
6.	Persuading	.877
7.	Negotiating	.875
8.	Education	.870
9.	Writing	.853
10.	Analyzing information or data	.837

Large Factor Scores

1.	Judges	2.26
2.	Physicians	2.24
3.	Miscellaneous teachers, college and university	2.07
4.	Clergymen	2.01
5.	Psychologists	1.87

2. Skilled use of tools and instruments (10 percent of variance)

Large Factor Loadings

1.	Assembling/Disassembling	.800
2.	Measuring devices	.782
3.	Non-precision tools and instruments - manual	.781
4.	Precision tools and instruments - powered	.780
5.	Non-precision tools and instruments - powered	.770
6.	Hand/Arm steadiness	.766
7.	Handling devices/tools - manual	.737
8.	Precision tools and instruments - manual	.721
9.	Setting-up/adjusting	.709
10.	Material controlling	.635

Large Factor Scores

1.	Electrotypers and stereotypers	3.24
2.	Auto body repairmen	2.75
3.	Physicians	2.49
4.	Pattern makers except paper	2.49
5.	Machinists	1.95

Appendix II -- Continued

3. Vehicle operation job elements (6 percent of variance)

Large Factor Loadings

1.	Hand-operated controls	-.890
2.	Foot-operated controls	-.880
3.	Far visual differentiation	-.728
4.	Highway/Rail vehicles	-.727
5.	Eye-hand/foot coordination	-.721
6.	Vigilence	-.661
7.	Outdoor environment	-.541
8.	Responsibility for safety of others	-.538
9.	Visual displays	-.513
10.	Environmental features, man-made	-.480

Large Factor Loadings

1.	Bus drivers	-4.50
2.	Taxi drivers	-3.19
3.	Delivery and routemen	-2.97
4.	Forklift and tow motor operatives	-2.95
5.	Truck drivers	-2.87

4. Work in unpleasant, hazardous environment (6 percent of variance)

Large Factor Loadings

1.	Air contamination	.705
2.	Dirty environment	.696
3.	Balancing	.695
4.	High temperature	.623
5.	Permanent total disability/death	.593
6.	Permanent partial impairment	.575
7.	Long-handled tools - manual	.535
8.	Noise intensity	.519
9.	Outdoor environment	.509
10.	Physical exertion	.506

Large Factor Scores

1.	Cement and concrete finishers	3.21
2.	Painters, construction and maintenance	2.48
3.	Carpenters	2.34
4.	Railroad brakemen	2.13
5.	Structural metal craftsmen	2.03

Appendix II -- Continued

5. Secondary labor market (4 percent of variance)

Large Factor Loadings

1.	Percent female	.705
2.	Serving/Catering	.560
3.	Percent nonwhite	.533
4.	Modifying manually	.381
5.	Job-related experience	-.300
6.	Using math	-.431
7.	Standard deviation of earnings	-.574
8.	Log mean earnings	-.744

Large Factor Scores

1.	Housekeepers, private	3.92
2.	Health aides except nursing	3.18
3.	Practical nurses	3.16
4.	Welfare service aides	2.77
5.	Waiters and waitresses	2.36

6. Clerical and related activities (3 percent of variance)

Large Factor Loadings

1.	Finger manipulation	.769
2.	Keyboard devices	.619
3.	Transcribing	.603
4.	Limb movement without visual control	.550
5.	Coding/Decoding	.538
6.	Sitting	.430

Large Factor Scores

1.	Stenographers	3.08
2.	Bookkeepers and billing machine operators	2.71
3.	Typists	2.60
4.	Secretaries, n.e.c.	2.55
5.	Key punch operators	2.51

Appendix II -- Continued

7. Regular hours, regular work (3 percent of variance)

Large Factor Loadings

1.	Regular hours	.888
2.	Typical day hours	.800
3.	Regular work	.552

Large Factor Scores

1.	Musicians and composers	-2.98
2.	Food counter and fountain workers	-2.56
3.	Flight engineers	-2.43
4.	Salesman, except retail	-2.32
5.	Airline pilots	-2.00

8. Retail Trade (2 percent of variance)

Large Factor Loadings

1.	Retail trade industry	.830
2.	Public customers	.715
3.	Serving/Catering	.418

Large Factor Scores

1.	Bartenders	4.69
2.	Restaurant managers	4.63
3.	Sales clerks, retail	3.69
4.	Cashiers	2.49
5.	Cooks, except private household	2.42

9. Arranging, positioning and handling (2 percent of variance)

Large Factor Loadings

1.	Arranging/Positioning	-.730
2.	Physical handling	-.488
3.	Repetitive activities	-.311
4.	Technical and related devices	-.273

Large Factor Scores

1.	Radiologic technologists	-3.93
2.	Physicians	-3.83
3.	Pharmacists	-2.84
4.	Dental hygienists	-2.26
5.	Metal platers	-2.08

Appendix II -- Continued

10. Durable goods production (2 percent of variance)

Large Factor Loadings

1.	Durable goods industry	.710
2.	Machines and equipment	.367
3.	Inspecting	.290
4.	Responsibility for material assets	.263
5.	Professional service	-.261

Large Factor Scores

1.	Forgemen and hammermen	3.21
2.	Job and die setters, metal	2.98
3.	Rollers and finishers, metal	2.78
4.	Grinding machine operatives	2.64
5.	Punch and stamping press operatives	2.53

11. Age and personal service (2 percent of variance)

Large Factor Loadings

1.	Average age	-.702
2.	Personal and recreational service industry	-.648
3.	Responsibility for material assets	-.353
4.	Percent nonwhite	-.243
5.	Mean education	.270

Large Factor Scores

1.	Housekeepers, private	-5.24
2.	Barbers	-4.28
3.	Clothing ironers and pressers	-2.77
4.	Attendants, recreation and amusement	-2.49
5.	Attendants, personal service	-1.82

12. Vocational training (2 percent of variance)

Large Factor Loadings

1.	Percent with vocational training	.638
2.	Transportation, communications, and utilities industry	.326
3.	Visual displays	.318
4.	Setting-up/Adjusting	.303
5.	Art/Decor	-.254

Appendix II -- Continued

12. Vocational training, continued

Large Factor Scores

1.	Hairdressers and cosmetologists	4.29
2.	Radiologic technicians	3.69
3.	Barbers	3.56
4.	Phone linemen and splicers	3.18
5.	Flight engineers	2.55

13. Entertaining, limb movement (2 percent of variance)

Large Factor Loadings

1.	Quantitative materials	.399
2.	Limb movement without visual control	-.381
3.	Entertaining	-.712

14. Nondurable goods production (2 percent of variance)

Large Factor Loadings

1.	Nondurable goods industry	.835
2.	Judging condition/quality	.400
3.	Noise intensity	.349

15. Equipment operation (2 percent of variance)

Large Factor Loadings

1.	Remote control equipment	.627
2.	Mobile equipment - manual	.477
3.	Operating equipment	.370
4.	Mobile equipment - powered	.287

16. Agriculture and related industries (2 percent of variance)

Large Factor Loadings

1.	Regular work	.362
2.	Agriculture industry	-.813

17. Business and repair service (2 percent of variance)

Large Factor Loadings

1.	Business and repair service industry	.774
2.	Buyers	.329
3.	Director of supervisory personnel	.312

18. Sound pattern recognition (2 percent of variance)

Large Factor Loadings

1.	Sound pattern recognition	.595
2.	Visual displays	.342
3.	Drawing and related devices	-.385

19. Finance and related industries (1 percent of variance)

Large Factor Loadings

1.	Finance, insurance, and real estate industry	-.652
2.	Public customers	-.253

20. Regular work (1 percent of variance)

Large Factor Loadings

1.	Regular work	.475
2.	Unemployment rate	-.325

21. Public administration (1 percent of variance)

Large Factor Loadings

1.	Transportation, communication, and utilities industry	.420
2.	Public administration industry	-.732

22. Patterns and related devices (1 percent of variance)

Large Factor Loadings

1.	Patterns and related devices	-.618
2.	Modifying manually	-.318
3.	Pictoral materials	-.282

23. Mining and related industries (1 percent of variance)

Large Factor Loadings

1. Mining industry	-.806
2. Construction industry	.256

24. Wholesale trade industry (1 percent of variance)

Large Factor Loadings

1. Wholesale trade industry	-.837

25. Inspecting and certification (1 percent of variance)

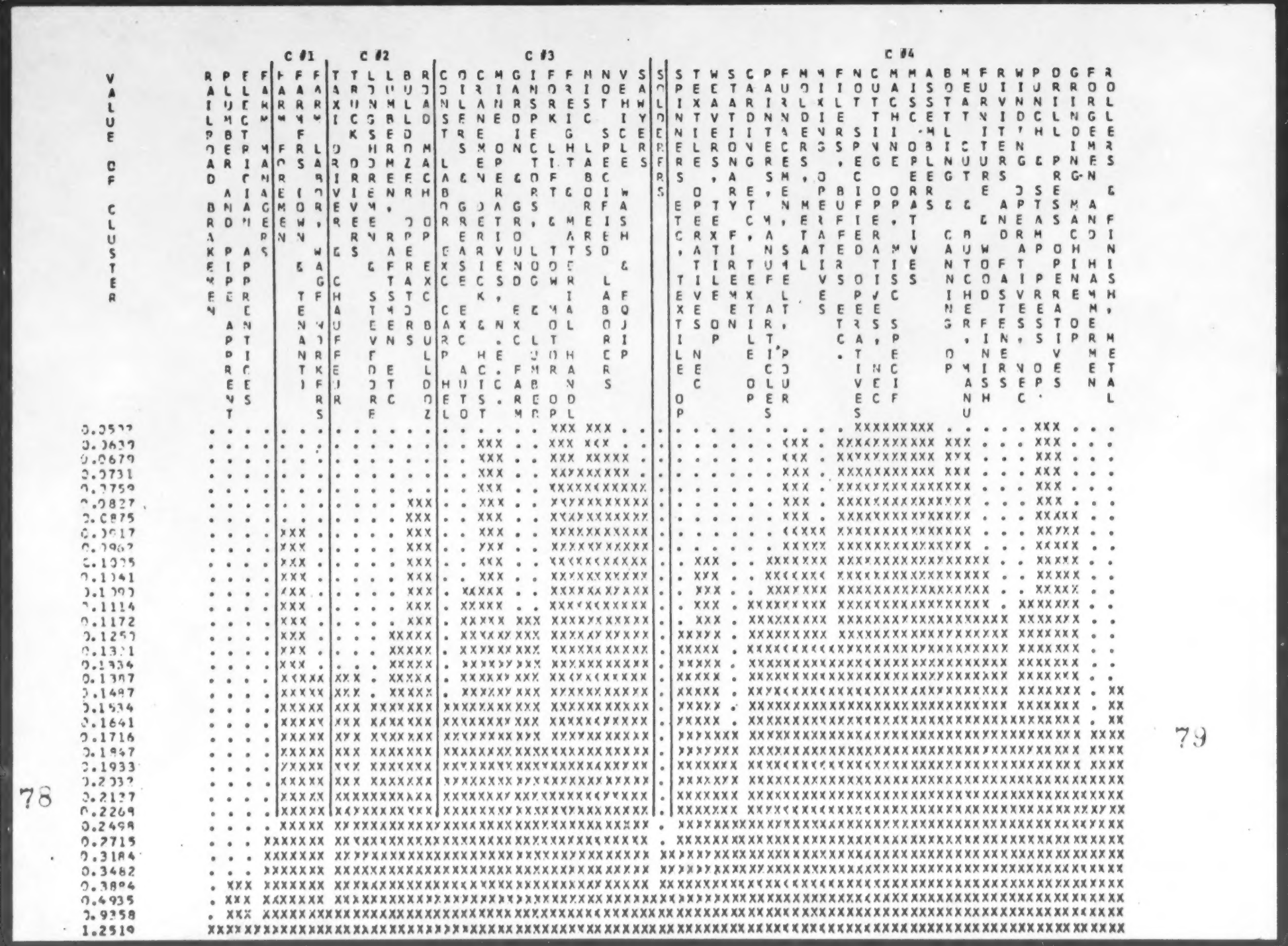
Large Factor Loadings

1. Inspecting	.465
2. License/Certification required	.378

Appendix III

Hierarchical Cluster Analysis Results

Variable Linkage Method


VALUE OF CLUSTER
C #1
C #2
C #3
C #4
RAILROAD BRAKEMEN
PLUMBER APPRENT
ELECTRICIAN APPRENTICES
FARM MANAGERS
FARMERS
FARM LABOR, WOMEN & TEENAGERS
FARM LABOR, MEN & STEVEDORES
TAXI DRIVERS
TRUCK DRIVERS
LONGSHOREMEN & STEVEDORE
LUMBERMEN, RAFTSMEN
BULLDOZER OPERATORS
ROAD MACH OPER EXC BULLDOZ
CONST LABOR EXC CARP HELP
COMMERCIAL & GOVERNMENT
CRANE & HOIST
MINE OPERATIVES, EXC. COAL MINERS
GARDENING & LANDSCAPING
INSPECTORS, LOG SCALERS & GRADERS
FORKLIFT & TRUCK OPERATORS
FREIGHT & MATERIAL HANDLERS
NIGHT LABORERS
NOT SPECIFIED LABORERS
VEHICLE WASHERS & EQUIP
SAWYERS
SOLDERERS
SPINNERS, TEXTILE OPERATIVES, ETC.
TEXTILE OPERATIVES NEC
WEAVERS, TEXTILE OPERATIVES
STATIONARY FIREMEN
SCARFING & CONDITIONING
PAINTERS, EXC CONSTRUCTION & MAINTENANCE
PAINTERS, CONSTRUCTION & MAINTENANCE
MILLWRIGHTS
MINING OPERATIVES, NEC
FILERS, BUFFERS & POLISHERS, ETC.
NOT SPECIFIED OPERATIVES
CONTROL OPERATORS, EXC PAPER & TEXTILE
MACHINE OPERATORS, NEC
MISCELLANEOUS OPERATIVES
ASSEMBLERS
BOOKBINDERS
CUTTERS & TRIMMERS
FURNITURE & WOOD FINISHERS
RIVETERS & AIRCRAFT ASSEMBLERS
WINDING & REELING MACHINE OPERATIVES
PUNCH & STAMP PRESS OPERATIVES
DRILLING MACHINE OPERATIVES
GRINDING, ABRADING, POLISHING & SHARPENING MACHINE OPERATIVES
FURNACEMEN, SMELTERMEN & POURERS
ROLLERS & FINISHERS, METAL
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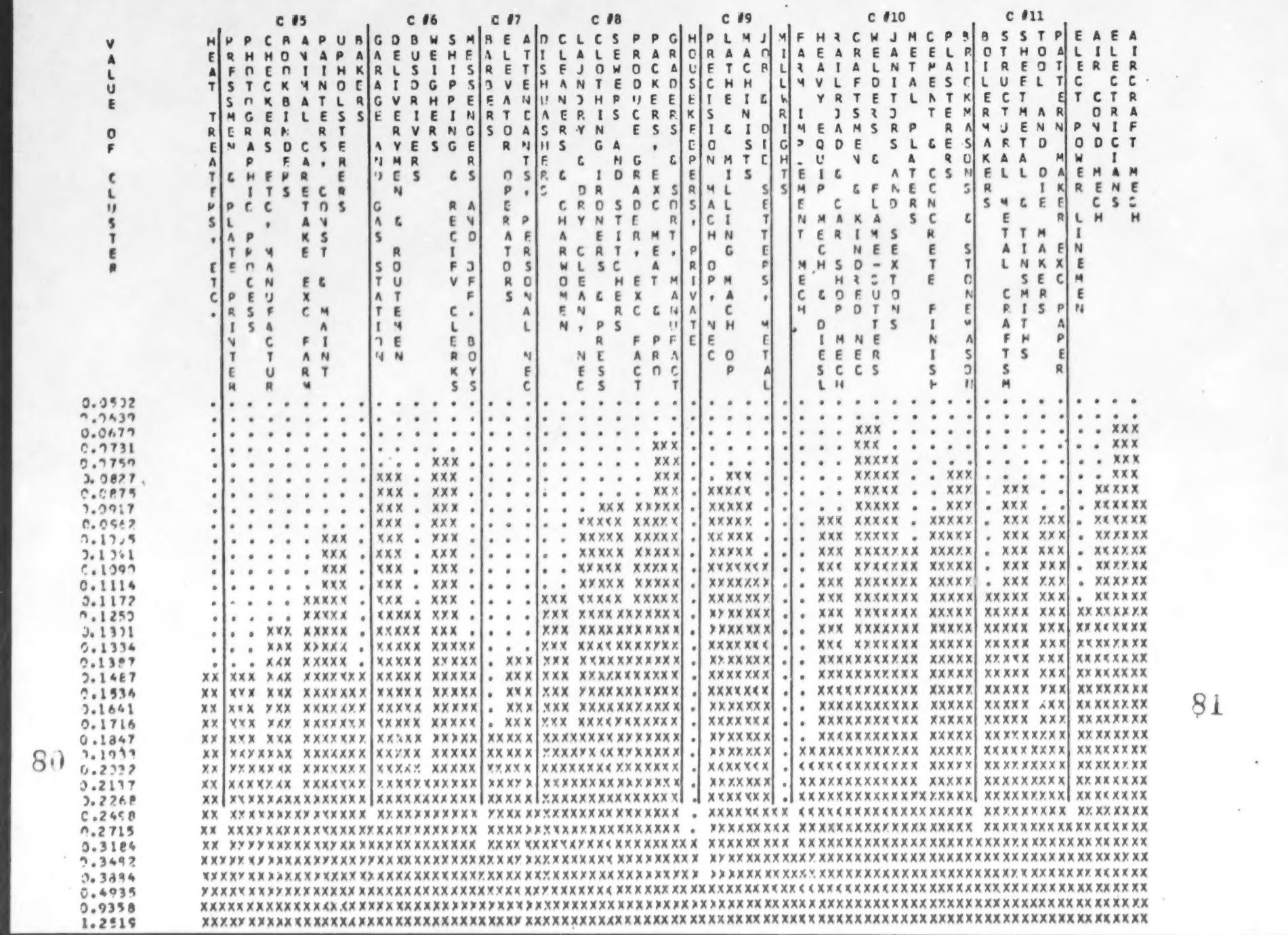

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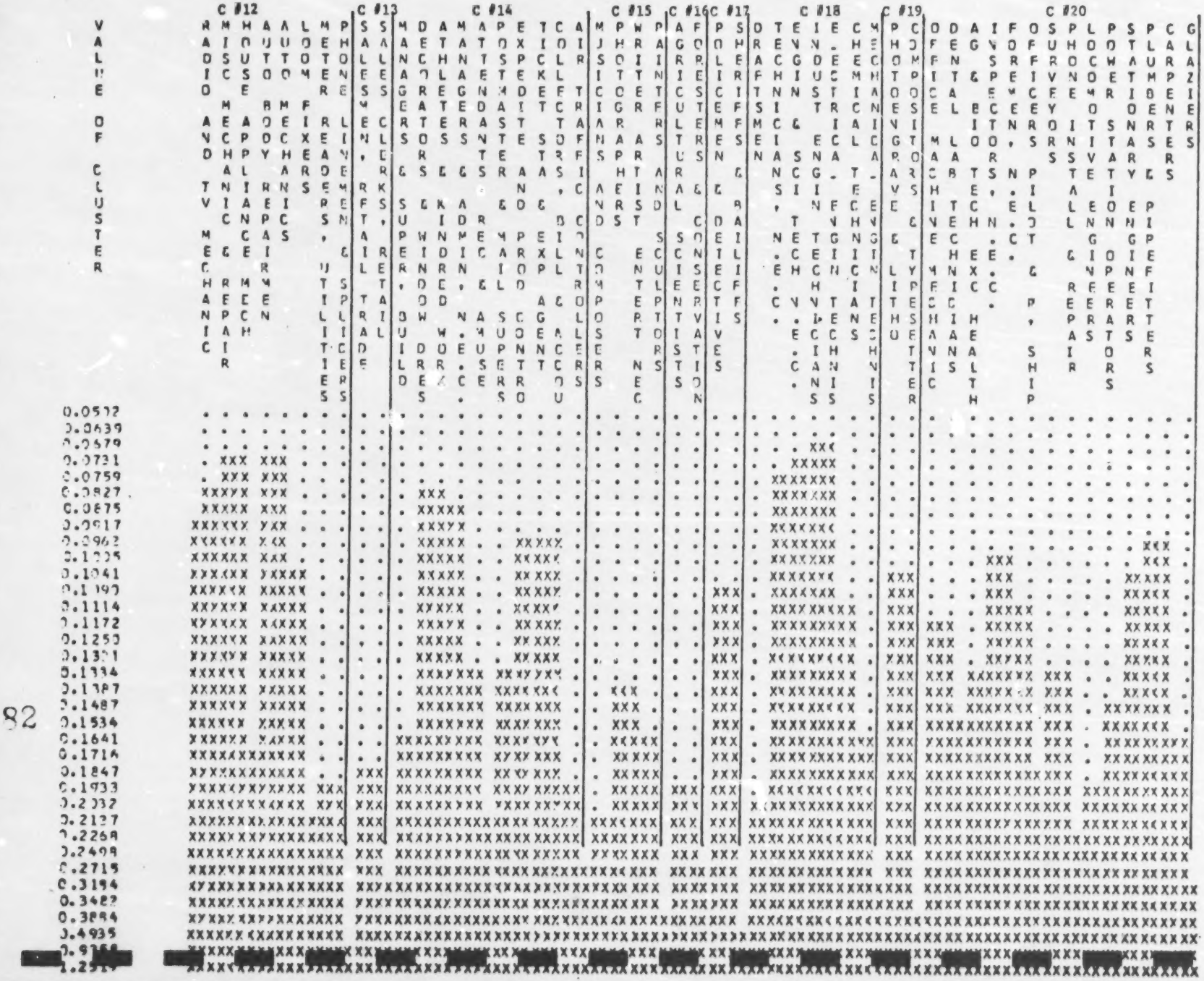
VALUE OF CLUSTER
C #12
RADIO AND TV REPAIR
MECHANIC & MECHANIC APPLIANCE REPAIR
MECHANIC
HOUSE & APPLIANCE REPAIRMEN
BODY REPAIRMEN
AUTO MECHANICS
LOOM FIXERS
METER READERS, UTILITIES
PHONE LINEMEN & SPLICERS
C #13
SALESMEN, RETAIL TRADE
SALESCLERKS, RETAIL
C #14
MANAGERS & SUPERVISORS, BUILDING
DECORATORS & WINDOW DRESSERS
DATHLE REGISTERS & KNITTING MACHINE OPERATORS
MANAGERS & ADMIN. EXEC.
ASTRONAUTS & RELATED SCIENTISTS
POSTMASTERS & MAILORS & SUPERVISORS
EXPEDITERS & PRODUCTION CONTROLLERS
TICKET & EXPEDITING AGENTS
COLLECTORS, STORE & ACCOUNT
AIR TRAFFIC CONTROLLERS
C #15
MUSICIANS & COMPOSERS
PHOTOGRAPHERS
WRITERS & AUTHORS
PAINTERS & SCULPTORS
C #16
AGRICULTURAL SCIENTISTS
FORESTERS & CONSERVATIONISTS
C #17
POLICEMEN & DETECTIVES
SHERIFFS & BAILIFFS
C #18
DRAFTSMEN
TECHNICIANS, N.E.C.
ENGINEERING & SCIENTIFIC TECHNICIANS, N.E.C.
INDUSTRIAL ENGINEERING TECHNICIANS
ELECTRICAL & ELECTRONIC ENGINEERING TECHNICIANS
MECHANICAL ENGINEERING TECHNICIANS
C #19
PHOTOENGRAVER & LITHO
COMPOSITORS & TYPESETTER
C #20
OFFICE MACHINE & MECHANIC
DENTAL LAB TECHNICIANS
AGRICULTURAL & BIOTECHNICAL HEALTH EXECUTIVES, N.E.C.
INSPECTORS, N.E.C.
FOREMEN, N.E.C.
OFFICERS, PILOT & PURSER, SHIP
SUPERVISORS
PHOTOENGRAVER & LITHO REPAIR
LOCOMOTIVE ENGINEERS
POWER STATION OPERATORS
STATIONARY ENGINEERS
PLUMBERS & PIPEFITTERS
CARPENTERS
GLAZIERS
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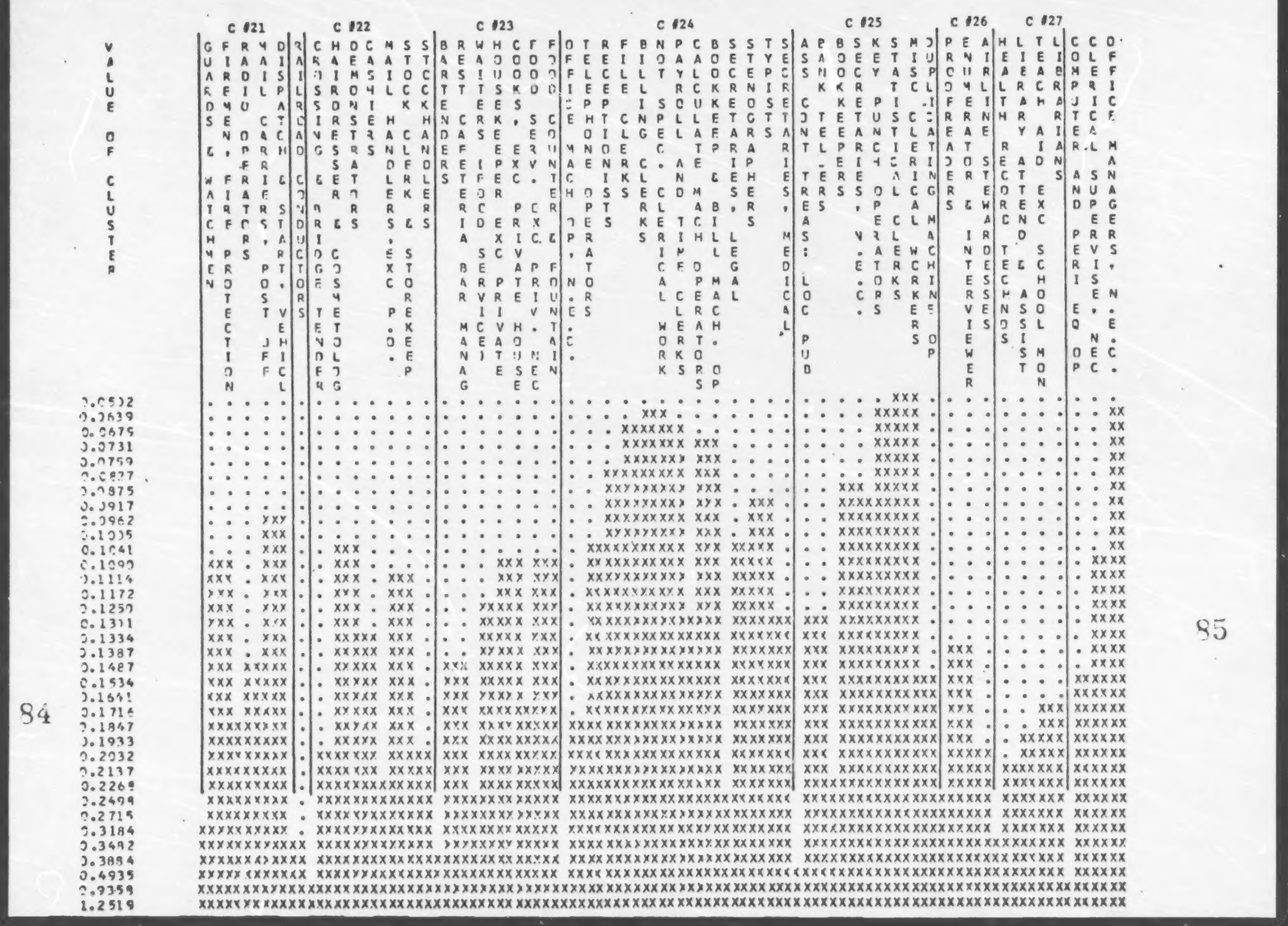
VALUE OF CLUSTER
C #21
GUARDS & WATCHMEN
FIREMEN, FIRE PROTECTION
RADIO OPERATORS
MAIL CARRIERS, POST OFF.
DISPATCH & STARTING VEHICL
RAILROAD CONDUCTORS
C #22
CROSSING & BRIDGE TENDER
CHAIRMEN & SECRETARIES & COMMITTEE MEMBERS
DEMONSTRATORS
CASHIERS
MAILHANDLERS, EXC P.O.
STOCK CLERKS & STOREKEEP
STOCKHANDLERS
C #23
BARTENDERS
RESTAURANT MANAG
CAFETERIA BAR
WAITERS, WAITRESS (FOOD SERVICE)
HOUSEKEEPER EXC PRIVATE HOUSE
COOKS, EXC PRIVATE HOUSE
FOOD SERV. EXC PRIV. HOUSE
FOOD COUNTER & FOUNTAIN
C #24
OFFICE MACH OP, N.E.C.
TELEPHONE OPERATORS
RECEPTIONISTS
FILE CLERKS
BILLING CLERICAL WORK
NOT SPEC. CLERICAL WORKERS
PAYROLL AND TIME CLERKS
CALCULATING MACH OPERATORS
BOOKKEEP & BILLING MACH. OP
BOOKKEEPERS, LEGAL
SECRETARIES, MEDICAL
STENOGRAPHERS
TYPISTS
SECRETARIES, EXC LEGAL, MEDICAL
C #25
ASST TREAS; LOC PUB
BANK TELLERS
BOOKKEEPERS
SECRETARIES, N.E.C.
KEYPUNCH OPERATORS
STATISTICAL CLERKS
MISCELLANEOUS CLERICAL WORKERS
DUPLICATING MACHINES OP
C #26
PROOFREADERS
ENUMERATORS & INTERVIEWERS
AIRLINE STEWARDESSES
C #27
HEALTH RECORD TECHNOS
LIBRARY ATTENDANTS & ASSISTANTS
TEACHER AID EXC SCHOOL MON
LIBRARIANS
COMPUTER AND PERIPHERAL EQUIP OP
COLLEGE SUPERVISORS, NEC
OFFICE MANAGERS, N.E.C.
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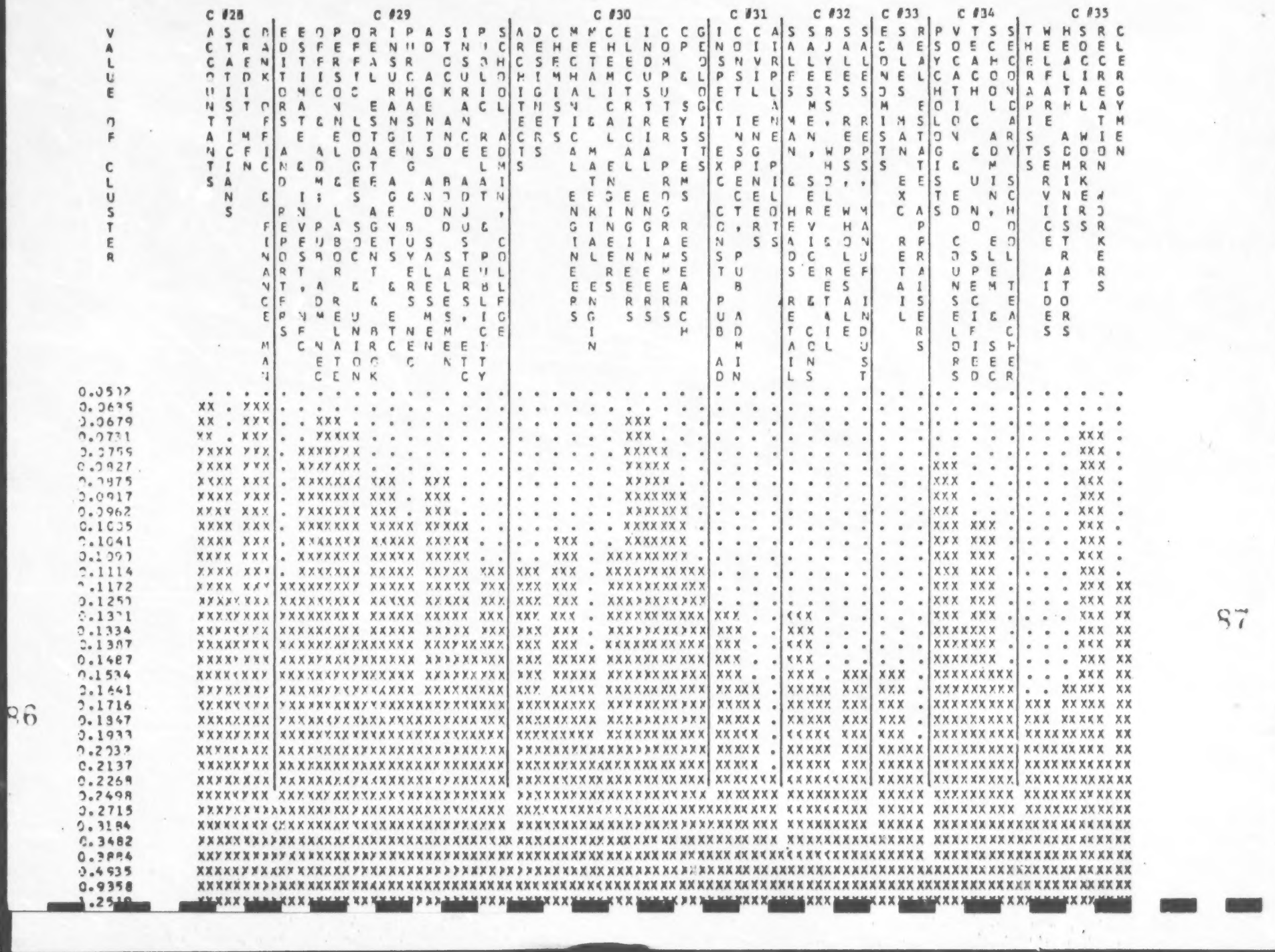
VALUE OF CLUSTER
C #28
ACCOUNTANTS
STATISTICIANS
CREDIT MEN
BANK OFFICERS & FINANCE MEN
C #29
EDITORS AND REPORTERS
ESTIMATORS & INVESTIGATORS, NEC
OFFICE ADMINISTRATORS, NEC
PERSONNEL & LABOR RELATIONS
OFFICE CLERKS, GENERAL
LODGES & SOCIETIES
REAL ESTATE AGENTS & BROKERS
INSURANCE AGENTS & BUYERS, NEC
PURCHASING AGENTS & BUYERS, NEC
ADVERTISING AGENTS AND SALESMEN
STOCK AND BOND SALESMEN
INSURANCE ADJUSTERS, ETC
PUBLIC RELATIONS & PUBLICITY
SCHOOL ADMIN, COLLEGE
C #30
ARCHITECTS
DESIGNERS
CHEMISTS
MECHANICAL ENGINEERS
METALLURGICAL ENGINEERS
CHEMICAL ENGINEERS
ELECTRICAL ENGINEERS
INDUSTRIAL ENGINEERS
COMPUTER PROGRAMMERS
CPA & SYSTEMS RESEARCH
GEOLOGISTS
AIRPLANE PILOTS
C #31
INSPECTORS, CONSTRUCTION
CONSTRUCTION INSPECT, PUB
CIVIL ENGINEERS
C #32
SALESMAN & HEADS RETAIL
SALESMEN, SERVICE & RETAIL
BUYERS, WHOLESALE & RETAIL
SALESREPS, WHOLESALE
SALESREPS, MANUFACTURING
C #33
ECONOMISTS
SALESMAN EXC RETAIL
REAL ESTATE APPRAISERS
C #34
PSYCHOLOGISTS
VOCATIONAL COUNSELORS
TEACHERS & SUPERVISORS
SCHOOL ADMIN, SPEC ED
SECONDARY SCHOOL TEACHERS
C #35
THERAPISTS
WELFARE SERVICE AIDES
HEALTH ADMINISTRATORS
SOCIAL WORKERS
RECREATION WORKERS
CLERGYMEN
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VALUE OF CLUSTER	ADULT EDUCATION TEACHERS	TEACH, EXC G, NEC.	C #36 MISC TEACH, COLL & UNIV	C #36 SCI CLG SCIENTISTS	PHARMACISTS	PHYSICIANS, MED & OSTEO	URBAN & REGION PLANNERS	LAWYERS	JUDGES	C #37 PRE & KINDERGARTEN TEACH	C #37 ELEMENTARY SCHOOL TEACH	C #37 DENTAL HYGIENISTS	C #37 RADIOLOGIC TECHNOS	C #37 CLINICAL LAB TECHNOS	C #37 HEALTH TECHNOS, NEC.	C #38 PRACTICAL NURSES	C #38 NURSING AIDES, ETC.	C #38 HEALTH AIDES EXC NURSING	DIETITIANS	REGISTERED NURSES
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